Illinois Department of Transportation

To:	Anthony J. Quigley	Attn:	Ken Eng
From:	Maureen M. Addis MA mma		
Subject:	Pavement Design Approval		
Date:	April 21, 2017		

Route:	IL 58	Job No.:	D-91-394-15
Section:	583-R	Contract No.:	62B16
County:	Cook	Target Letting:	June 2017
Limits:	at Wolf Road (Cumberland Circle)		

We have reviewed the pavement design for the above referenced project which was submitted on April 5, 2017. The scope of the project is reconstruction of the existing traffic circle to provide a modern five-legged roundabout.

We concur with the District's opinion this is a "special design" as the roundabout is a "high-stress" intersection; and as such, a life cycle cost analysis is not necessary.

In summary, the approved pavement design is as follows:

<u>IL 58 / Roundabout and Truck Apron</u>
9.75" Jointed PCC Pavement w/ tied Curb & Gutter
12" Aggregate Subgrade Improvement

<u>Wolf Road</u>
8.25" Jointed PCC Pavement w/ tied Curb & Gutter
12" Aggregate Subgrade Improvement

<u>Broadway Street and State Street</u>
8" Jointed PCC Pavement w/ tied Curb & Gutter
12" Aggregate Subgrade Improvement

If you have any questions, please contact Mike Brand at (217) 782-7651.

Illinois Department of Transportation

Memorandum

To: Maureen Addis Attn: Michael Brand

From: Jose A. Dominguez By: Ojas Patel

Subject: Pavement Analysis*

Date: April 5, 2017

*Route: Illinois Route 58
Limits: at Wolf Road (Cumberland Circle)
Section: 583-R
Current target: 06CY17

County: Cook
Contract No.: 62B16
Job No.: D-91-394-15

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction exceeds 4,750 Square Yards. NOTE: Review is not required for State Street as this roadway is under local jurisdiction and the State Street pavement design is included for your information. The following is the scope of the project:

Reconstruction of the existing traffic circle at IL 58 at Wolf Road to provide a modern 5-legged roundabout.

A 20-year pavement analysis was performed for the above roundabout and roadway segments. This intersection is a "High Stress" location since the design lane as well as turning MU ADT exceeds 200 vehicles. As such, this pavement design will be classified as a "Special Design" per BDE Figure 54-1.A. A mechanistic-rigid pavement design is recommended for ease of construction due to the complex geometry and varying cross sections of this roundabout. In addition, with this project located in an urban setting, PCC pavement is desirable as it will have lower future maintenance needs than asphalt and will result in less disruption to traffic. The recommended pavement is:

IL 58/Roundabout & Truck Apron
Reconstruction
PCC Curb and Gutter (Tied)
9 ¾" PCC Pavement, (Jointed)[1]
12" Aggregate Subgrade Improvement[4]

Wolf Road
Reconstruction
PCC Curb and Gutter (Tied)
8 ¼" PCC Pavement, (Jointed)[2]
12" Aggregate Subgrade Improvement[4]

Broadway Street
Reconstruction
PCC Curb and Gutter (Tied)
8" PCC Pavement, (Jointed)[3]
12" Aggregate Subgrade Improvement[4]

State Street (Local Jurisdiction)[5]
Reconstruction
PCC Curb and Gutter (Tied)
8" PCC Pavement, (Jointed)[3]
12" Aggregate Subgrade Improvement[4]

[1]Designer Note 1: Use pay item **42000416, PORTLAND CEMENT CONCRETE PAVEMENT 9 ¾" (JOINTED),** paid for in square yards. When variable width lanes (12'-18') exceed 14 feet in width a centerline joint should be added to avoid longitudinal cracking; see Bureau of Design Standard 53.

[2]Designer Note 2: Use pay item **42000306, PORTLAND CEMENT CONCRETE PAVEMENT 8 ¼" (JOINTED),** paid for in square yards. Transverse contraction joints should be reduced to a maximum of 12 ½ foot spacing for 8 ¼" PCC pavement. When variable width lanes (12'-18') exceed 14 feet in width a centerline joint should be added to avoid longitudinal cracking; see Bureau of Design Standard 53.

[3]Designer Note 3: Use pay item **42000301, PORTLAND CEMENT CONCRETE PAVEMENT 8" (JOINTED),** paid for in square yards. Transverse contraction joints should be reduced to a maximum of 12 foot spacing for 8" PCC pavement. When variable width lanes (12'-18') exceed 14 feet in width a centerline joint should be added to avoid longitudinal cracking; see Bureau of Design Standard 53.

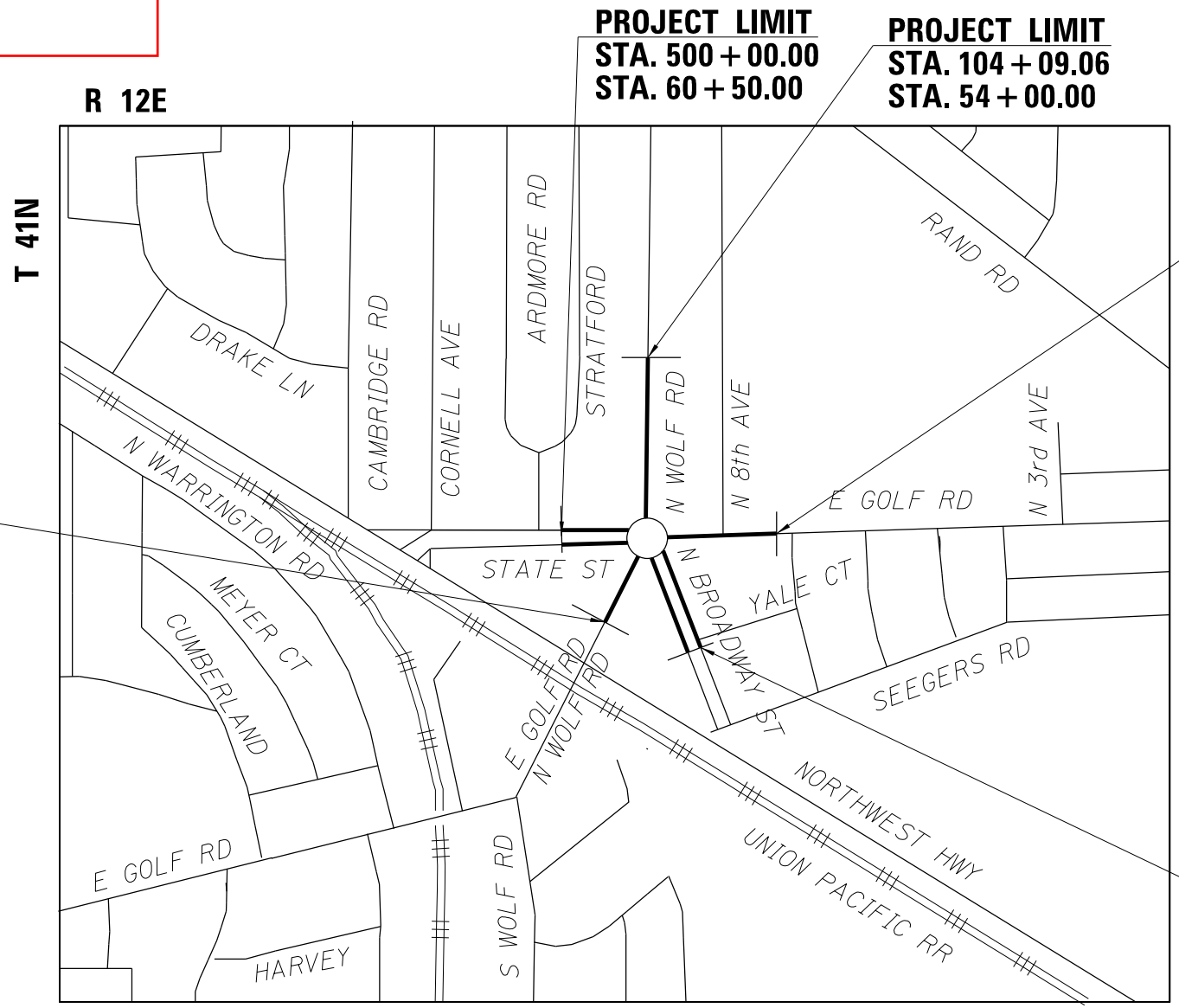
[5]Designer Note 5: Use pay item **30300112, AGGREGATE SUBGRADE IMPROVEMENT, 12"**, paid in square yards.

[6]Designer Note 6: State Street is subject to local jurisdictional approval and concurrence.

If you have any questions or need additional information, please contact Ojas Patel, Pavement Design Engineer, at (847)705-4550.

By: José A. Dominguez
Jose A. Dominguez, P.E.
Project Support Engineer

LOCATION MAP



MAINE TOWNSHIP
IMPROVEMENT LOCATED IN CITY OF
DES PLAINES, COOK COUNTY IL

LOCATION MAP

NOT TO SCALE

BDE 5401 Template (Rev. 09/05/2013) **IDOT MECHANISTIC PAVEMENT DESIGN** Printed: 10/24/2017

PROJECT AND TRAFFIC INPUTS (Enter Data in Gray Shaded Cells)

Route: IL 58 | Comments: IL 58 @ Wolf Rd (Roundabout)
Section: 583-R
County: Cook | Design Date: 02/10/2017
Location: at Wolf Road (Roundabout) | Modify Date:
Facility Type: Other Marked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2018
Design Period (DP) = 20 years

	ADT	Year
Current:	29,700	2015
Future:	33,000	2040

	Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	28,777	91.6%	P = 32%
SU =	250	1,539	4.9%	S = 45%
MU =	750	1,100	3.5%	M = 45%
Struct. Design ADT =		31,416	(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	6.64	(Actual ADT)	TF rigid (Actual) =	8.91	(Actual ADT)
TF flexible (Min) =	3.56	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	5.02	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 6.64
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 70 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 11.25 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 11.25 inches

JPC Pavement

Use TF rigid = 8.91
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.75 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 8.91
IBR value = 3

CRCP Thickness = 8.75 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 6.64
HMA Overlay Design Thickness = 8.50 in. (Fig. 54-5.U)
Goto Map
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 09/05/2013) Printed: 10/24/2017

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	**IL 58**
SECTION	**583-R**
COUNTY	**Cook**
LOCATION	**at Wolf Road (Roundabout)**
FACILITY TYPE	**NON-INTERSTATE**

PROJECT LENGTH			**850**	FT = = >	0.16 Miles
# OF CENTERLINES			**3**	CL	
# OF LANES			**4**	LANES	
# OF EDGES			**2**	EP	
LANE WIDTH - AVERAGE			**12**	FT	
SHOULDER WIDTH	HMA	Left	**0**	FT	
	HMA	Right	**0**	FT	
	Total Width of Paved Shoulders		**0**	FT	

PAVEMENT THICKNESS (FLEXIBLE)	**11.25** IN	**14.50** IN MAX	
SHOULDER THICKNESS	**8.00** IN	HMA_SD	**Standard Design**
POLICY OVERLAY THICKNESS	**2.25** IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	3.56	**6.64**	**6.64**

Read Me!

HMA COST PER TON	UNIT PRICE	
HMA SURFACE	**$112.21**	/ TON
HMA TOP BINDER	**$109.43**	/ TON
HMA LOWER BINDER	**$75.43**	/ TON
HMA BINDER (LEVELING)	**$109.43**	/ TON
HMA SHOULDER	**$72.00**	/ TON

INITIAL COSTS

ITEM	THICKNESS		100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(11.25")	4533	4,533	SQ YD	*	**$56.52**	/ SQ YD	$256,224	~
HMA SURFACE COURSE	(2.00")	1.0035	509	TONS		**$112.21**	/ TON	$0	
HMA TOP BINDER COURSE	(2.25")	1.0109	577	TONS		**$109.43**	/ TON	$0	
HMA LOWER BINDER COURSE	(7.00")	1.0269	1,825	TONS		**$75.43**	/ TON	$0	
HMA SHOULDER	(8.00")	0	0	TONS		**$72.00**	/ TON	$0	~
CURB & GUTTER			1,700	LIN FT	*	**$30.00**	/ LIN FT	$51,000	
SUBBASE GRAN MATL TY C (TONS)			15	TONS		**$25.00**	/ TON	$375	
IMPROVED SUBGRADE:	Aggregate	Width = 50.9'	4,805	SQ YD		**$7.00**	/ SQ YD	$33,635	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
PAVEMENT REMOVAL			4,533	SQ YD		**$15.00**	/ SQ YD	$67,995	
SHOULDER REMOVAL			0	SQ YD		**$0.00**	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$409,229
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$103,677

MAINTENANCE COSTS:

ITEM		THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY						**$0.00**	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	1.0035	Surface Mix	2.00	**$12.61**	/ SQ YD
HMA OVERLAY PVMT		(2.25")	1.0039		2.25	**$14.08**	/ SQ YD
HMA SURFACE MIX		(1.50")	1.0026	Surface Mix	1.50	**$9.45**	/ SQ YD
HMA BINDER MIX		(0.75")	1.0065	eling Binder Mix	0.75	**$4.63**	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")		Shoulder Mix	2.25	**$9.07**	/ SQ YD
HMA OVERLAY SHLD		(2.00")		Shoulder Mix	2.00	**$8.06**	/ SQ YD
MILLING (2.00 IN)					2.00	**$3.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)		Surface Mix	2.00	**$82.57**	/ SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	**$78.06**	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	**$82.26**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	**$78.06**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			**$2.00**	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$536,032
FLEXIBLE TOTAL ANNUAL COST PER MILE	$135,803

PCC PAVEMENT — JPCP

ROUTE			IL 58		
SECTION			583-R		
COUNTY			Cook		
LOCATION			at Wolf Road (Roundabout)		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			850 FT	= = >	0.16 Miles
# OF CENTERLINES			3 CL		
# OF LANES			4 LANES		
# OF EDGES			2 EP		
LANE WIDTH - AVERAGE			12 FT		
SHOULDER WIDTH	PCC	Left	0 FT		
	PCC	Right	0 FT		
	Total Width of Paved Shoulders		0 FT		
PAVEMENT THICKNESS (RIGID)		JPCP	9.75 IN	TIED SHLD	
SHOULDER THICKNESS			9.75 IN		
POLICY OVERLAY THICKNESS			2.50 IN		

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	5.02	8.91	8.91
Worksheet Construction Type is Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(9.75")	4,533	SQ YD		$67.93	/ SQ YD	$307,927
PAVEMENT REINFORCEMENT		0	SQ YD		$22.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	0	SQ YD	*	$19.00	/ SQ YD	$0
PCC SHOULDERS		0	SQ YD		$40.00	/ SQ YD	$0
CURB & GUTTER		1,700	LIN FT	*	$30.00	/ LIN FT	$51,000
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS		$25.00	/ TON	$0
IMPROVED SUBGRADE:	Aggregate Width = 49.0'	4,628	SQ YD		$7.00	/ SQ YD	$32,396
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		4,533	SQ YD		$15.00	/ SQ YD	$67,995
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$459,318
RIGID CONSTRUCTION ANNUAL COST PER MILE	$116,367

MAINTENANCE COSTS:

ITEM	THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY					$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			2.50		
HMA POLICY OVERLAY PVMT	(2.50")	1.0043		2.50	$15.62	/ SQ YD
HMA SURFACE MIX	(1.50")	1.0026	Surface Mix	1.50	$9.45	/ SQ YD
HMA BINDER MIX	(1.00")	1.0069	eling Binder Mix	1.00	$6.17	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder Mix	2.50	$10.08	/ SQ YD
CLASS A PAVEMENT PATCHING					$195.00	/ SQ YD
CLASS B PAVEMENT PATCHING					$150.00	/ SQ YD
CLASS C SHOULDER PATCHING					$145.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)			Surface Mix	1.50	$79.43	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")			Surface Mix	2.50	$85.71	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL					$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)				$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$534,586
RIGID TOTAL ANNUAL COST PER MILE	$135,436

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **2/16/17 8:59 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$459,318	$409,229
		ANNUAL COST PER MILE	$116,367	$103,677
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$75,268	$126,803
		ANNUAL COST PER MILE	$19,069	$32,125
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$534,586	$536,032
		ANNUAL COST PER MILE	$135,436	$135,803

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$135,436**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$135,803**	0.3%

S:\GEN\WPDOCS\Pavement Designs\D-1\IL 58 at Wolf Road - 62B16\[IL 58_IDOT Mech Pvmt Dgn LCCA 09-05-13.xlsm]PDFSheets

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CNTR LINE JOINT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RNDM / THRM CRACK R&S	50.00%	1,870	LIN FT	$2.00		$3,740	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$82.57		$413	
	PWFn =	0.8626		PW =	0.8626	X	$12,653	$10,915
YEAR 10								
	LONG SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CNTR LINE JOINT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RNDM / THRM CRACK R&S	50.00%	1,870	LIN FT	$2.00		$3,740	
	PD PVMT PATCH M&F SURF	0.50%	23	SQ YD	$82.57		$1,899	
	PWFn =	0.7441		PW =	0.7441	X	$14,139	$10,521
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	4,533	SQ YD	$3.00		$13,599	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	45	SQ YD	$82.26		$3,702	
	HMA OVERLAY PVMT 2.00"	100.00%	4,533	SQ YD	$12.61		$57,171	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$8.06		$0	
	PWFn =	0.6419		PW =	0.6419	X	$74,472	$47,801
YEAR 20								
	LONG SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CNTR LINE JOINT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RNDM / THRM CRACK R&S	50.00%	1,870	LIN FT	$2.00		$3,740	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$82.57		$413	
	PWFn =	0.5537		PW =	0.5537	X	$12,653	$7,006
YEAR 25								
	LONG SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CNTR LINE JOINT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RNDM / THRM CRACK R&S	50.00%	1,870	LIN FT	$2.00		$3,740	
	PD PVMT PATCH M&F SURF	0.50%	23	SQ YD	$82.57		$1,899	
	PWFn =	0.4776		PW =	0.4776	X	$14,139	$6,753

YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	4,533	SQ YD	$3.00		$13,599	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	91	SQ YD	$82.26		$7,485	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	$78.06		$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	4,533	SQ YD	$14.08		$63,812	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	$9.07		$0	
	PWFn =	0.4120		PW =	0.4120	X	$84,896	$34,976
YEAR 35								
	LONG SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CNTR LINE JOINT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RNDM / THRM CRACK R&S	50.00%	1,870	LIN FT	$2.00		$3,740	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$82.57		$413	
	PWFn =	0.3554		PW =	0.3554	X	$12,653	$4,497
YEAR 40								
	LONG SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CNTR LINE JOINT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RNDM / THRM CRACK R&S	50.00%	1,870	LIN FT	$2.00		$3,740	
	PD PVMT PATCH M&F SURF	0.50%	23	SQ YD	$82.57		$1,899	
	PWFn =	0.3066		PW =	0.3066	X	$14,139	$4,334
								$126,803
	ROUTINE MAINTENANCE ACTIVITY		0.64	Lane Miles	0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$126,803
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$32,125

JPCP | MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE | 10/24/17

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	5	SQ YD	$150.00		$750	
	PWFn =	0.7441		PW =	0.7441	X	$750	$558
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	9	SQ YD	$150.00		$1,350	
	PWFn =	0.6419		PW =	0.6419	X	$1,350	$867
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	91	SQ YD	$150.00		$13,650	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$145.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CENTERLINE JT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	PWFn =	0.5537		PW =	0.5537	X	$22,150	$12,264
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	136	SQ YD	$150.00		$20,400	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$145.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$20,400	$9,743
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	181	SQ YD	$150.00		$27,150	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$145.00		$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	4,533	SQ YD	$15.62		$70,814	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	$10.08		$0	
	PWFn =	0.4120		PW =	0.4120	X	$97,964	$40,360
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CENTERLINE JT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	RANDOM CRACK R&S	50.00%	1,700	LIN FT	$2.00		$3,400	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,094	LIN FT	$2.00		$2,188	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	5	SQ YD	$85.71		$429	
	PWFn =	0.3554		PW =	0.3554	X	$14,517	$5,159
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	23	SQ YD	$150.00		$3,450	
	LONGITUDINAL SHLD JT R&S	100.00%	1,700	LIN FT	$2.00		$3,400	
	CENTERLINE JT R&S	100.00%	2,550	LIN FT	$2.00		$5,100	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,642	LIN FT	$2.00		$3,284	
	RANDOM CRACK R&S	50.00%	1,700	LIN FT	$2.00		$3,400	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	23	SQ YD	$85.71		$1,971	
	PWFn =	0.3066		PW =	0.3066	X	$20,605	$6,317
								$75,268
	ROUTINE MAINTENANCE ACTIVITY		0.64	Lane Miles	$0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$75,268
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$19,069

BDE 5401 Template (Rev. 09/05/2013)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 10/24/2017

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Broadway Street
Section: 583-R
County: Cook
Location: at Wolf Road (Roundabout)
Facility Type: Unmarked State Route

Comments: IL 58 @ Wolf Rd (Roundabout)
PCC Minimum thickness is 8" (LCCA unit cost based on 8")
Design Date: 02/10/2017 <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	2,300	2015
Future:	4,000	2040

# of Lanes = 2 or 3
Part of future 4 lanes or more ? No
One Way Street ? No
Road Class: II

Subgrade Support Rating (SSR): Poor
Construction Year: 2018
Design Period (DP) = 20 years

	Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	No Min	2,945	92.5%	P = 50%
SU =	No Min	191	6.0%	S = 50%
MU =	No Min	48	1.5%	M = 50%
Struct. Design ADT =		3,184	(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	112.06		Csu =	135.78	
Cmu =	385.44		Cmu =	567.21	
TF flexible (Actual) =	0.40	(Actual ADT)	TF rigid (Actual) =	0.53	(Actual ADT)
TF flexible (Min) =	No Min	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	No Min	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 0.50 Per BDE 54-5.01(i)-1g
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 147 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 7.00 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 7.00 inches

JPC Pavement

Use TF rigid = 0.53
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 7.75 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 0.53
IBR value = 3

CRCP Thickness = 5.50 in. (Fig. 54-4.N)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 0.50
HMA Overlay Design Thickness = 4.75 in. (Fig. 54-5.U)
Goto Map
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 09/05/2013) Printed: 10/24/2017

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	**Broadway Street**
SECTION	**583-R**
COUNTY	**Cook**
LOCATION	**at Wolf Road (Roundabout)**
FACILITY TYPE	**NON-INTERSTATE**

PROJECT LENGTH			**510**	FT = = >	0.10 Miles
# OF CENTERLINES			**0**	CL	
# OF LANES			**2**	LANES	
# OF EDGES			**4**	EP	
LANE WIDTH - AVERAGE			**20**	FT	
SHOULDER WIDTH	HMA	Inside	**0**	FT	
	HMA	Outside	**0**	FT	
	Total Width of Paved Shoulders		**0**	FT	

PAVEMENT THICKNESS (FLEXIBLE)	**7.00** IN	**14.50** IN MAX	
SHOULDER THICKNESS	**8.00** IN	HMA_SD	**Standard Design**
POLICY OVERLAY THICKNESS	**2.25** IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	No Min	**0.40**	**0.40**

Read Me!

HMA COST PER TON	UNIT PRICE	
HMA SURFACE	**$108.39**	/ TON
HMA TOP BINDER	**$106.00**	/ TON
HMA LOWER BINDER	**$111.85**	/ TON
HMA BINDER (LEVELING)	**$106.00**	/ TON
HMA SHOULDER	**$72.00**	/ TON

INITIAL COSTS

ITEM	THICKNESS		100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(7.00")	2267	2,267	SQ YD	*	**$43.22**	/ SQ YD	$97,965	~
HMA SURFACE COURSE	(2.00")	1.0083	256	TONS		**$108.39**	/ TON	$0	
HMA TOP BINDER COURSE	(2.25")	1.0260	293	TONS		**$106.00**	/ TON	$0	
HMA LOWER BINDER COURSE	(2.75")	1.0469	365	TONS		**$111.85**	/ TON	$0	
HMA SHOULDER	(8.00")	0	0	TONS		**$72.00**	/ TON	$0	~
CURB & GUTTER			2,040	LIN FT	*	**$30.00**	/ LIN FT	$61,200	
SUBBASE GRAN MATL TY C (TONS)			0	TONS		**$25.00**	/ TON	$0	
IMPROVED SUBGRADE:	Aggregate	Width = 44.3'	2,512	SQ YD		**$7.00**	/ SQ YD	$17,584	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
PAVEMENT REMOVAL			2,267	SQ YD		**$15.00**	/ SQ YD	$34,005	
SHOULDER REMOVAL			0	SQ YD		**$0.00**	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$210,754
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$88,990

MAINTENANCE COSTS:

ITEM		THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY						**$0.00**	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	1.0083	Surface Mix	2.00	**$12.24**	/ SQ YD
HMA OVERLAY PVMT		(2.25")	1.0094		2.25	**$13.68**	/ SQ YD
HMA SURFACE MIX		(1.50")	1.0063	Surface Mix	1.50	**$9.16**	/ SQ YD
HMA BINDER MIX		(0.75")	1.0156	eling Binder Mix	0.75	**$4.52**	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")		Shoulder Mix	2.25	**$9.07**	/ SQ YD
HMA OVERLAY SHLD		(2.00")		Shoulder Mix	2.00	**$8.06**	/ SQ YD
MILLING (2.00 IN)					2.00	**$3.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)		Surface Mix	2.00	**$82.14**	/ SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	**$78.06**	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	**$81.87**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	**$78.06**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			**$2.00**	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$270,072
FLEXIBLE TOTAL ANNUAL COST PER MILE	$114,037

PCC PAVEMENT — JPCP

ROUTE			Broadway Street		
SECTION			583-R		
COUNTY			Cook		
LOCATION			at Wolf Road (Roundabout)		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			510 FT = = >	0.10	Miles
# OF CENTERLINES			0 CL		
# OF LANES			2 LANES		
# OF EDGES			4 EP		
LANE WIDTH - AVERAGE			20 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		
	Total Width of Paved Shoulders		0 FT		
PAVEMENT THICKNESS (RIGID)		JPCP	7.75 IN	TIED SHLD	
SHOULDER THICKNESS			7.75 IN		
POLICY OVERLAY THICKNESS			2.50 IN		

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		No Min	0.53	0.53
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(7.75")	2,267	SQ YD		$62.50	/ SQ YD	$141,688
PAVEMENT REINFORCEMENT		0	SQ YD		$22.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	0	SQ YD	*	$19.00	/ SQ YD	$0
PCC SHOULDERS		0	SQ YD		$40.00	/ SQ YD	$0
CURB & GUTTER		2,040	LIN FT	*	$30.00	/ LIN FT	$61,200
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS		$25.00	/ TON	$0
IMPROVED SUBGRADE:	Aggregate Width = 42.0'	2,380	SQ YD		$7.00	/ SQ YD	$16,660
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		2,267	SQ YD		$15.00	/ SQ YD	$34,005
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$253,553
RIGID CONSTRUCTION ANNUAL COST PER MILE	$107,062

MAINTENANCE COSTS:

ITEM	THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY					$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			2.50		
HMA POLICY OVERLAY PVMT	(2.50")	1.0104		2.50	$15.20	/ SQ YD
HMA SURFACE MIX	(1.50")	1.0063	Surface Mix	1.50	$9.16	/ SQ YD
HMA BINDER MIX	(1.00")	1.0167	eling Binder Mix	1.00	$6.03	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder Mix	2.50	$10.08	/ SQ YD
CLASS A PAVEMENT PATCHING					$195.00	/ SQ YD
CLASS B PAVEMENT PATCHING					$150.00	/ SQ YD
CLASS C SHOULDER PATCHING					$145.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)			Surface Mix	1.50	$79.10	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")			Surface Mix	2.50	$85.17	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL					$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)				$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$290,057
RIGID TOTAL ANNUAL COST PER MILE	$122,476

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **2/16/17 11:21 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$253,553	$210,754
		ANNUAL COST PER MILE	$107,062	$88,990
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$36,504	$59,318
		ANNUAL COST PER MILE	$15,414	$25,047
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$290,057	$270,072
		ANNUAL COST PER MILE	$122,476	$114,037

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**HMA**	**$114,037**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**JPCP**	**$122,476**	7.4%

S:\GEN\WPDOCS\Pavement Designs\D-1\IL 58 at Wolf Road - 62B16\[Broadway St_IDOT Mech Pvmt Dgn LCCA 09-05-13.xlsm]PDFSheets

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$82.14		$164	
	PWFn =	0.8626		PW =	0.8626	X	$5,366	$4,629
YEAR 10								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.50%	11	SQ YD	$82.14		$904	
	PWFn =	0.7441		PW =	0.7441	X	$6,106	$4,543
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	2,267	SQ YD	$3.00		$6,801	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	23	SQ YD	$81.87		$1,883	
	HMA OVERLAY PVMT 2.00"	100.00%	2,267	SQ YD	$12.24		$27,746	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$8.06		$0	
	PWFn =	0.6419		PW =	0.6419	X	$36,430	$23,383
YEAR 20								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$82.14		$164	
	PWFn =	0.5537		PW =	0.5537	X	$5,366	$2,971
YEAR 25								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.50%	11	SQ YD	$82.14		$904	
	PWFn =	0.4776		PW =	0.4776	X	$6,106	$2,916
	HMA_SD							
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	2,267	SQ YD	$3.00		$6,801	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	45	SQ YD	$81.87		$3,684	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	$78.06		$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	2,267	SQ YD	$13.68		$31,015	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	$9.07		$0	
	PWFn =	0.4120		PW =	0.4120	X	$41,500	$17,097
YEAR 35								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$82.14		$164	
	PWFn =	0.3554		PW =	0.3554	X	$5,366	$1,907
YEAR 40								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.50%	11	SQ YD	$82.14		$904	
	PWFn =	0.3066		PW =	0.3066	X	$6,106	$1,872
								$59,318
	ROUTINE MAINTENANCE ACTIVITY		0.19	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$59,318
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$25,047

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	2	SQ YD	$150.00		$300	
	PWFn =	0.7441		PW =	0.7441	X	$300	$223
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	5	SQ YD	$150.00		$750	
	PWFn =	0.6419		PW =	0.6419	X	$750	$481
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	45	SQ YD	$150.00		$6,750	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$145.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	PWFn =	0.5537		PW =	0.5537	X	$10,830	$5,996
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	68	SQ YD	$150.00		$10,200	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$145.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$10,200	$4,872
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	91	SQ YD	$150.00		$13,650	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$145.00		$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	2,267	SQ YD	$15.20		$34,446	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	$10.08		$0	
	PWFn =	0.4120		PW =	0.4120	X	$48,096	$19,815
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	RANDOM CRACK R&S	50.00%	510	LIN FT	$2.00		$1,020	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	544	LIN FT	$2.00		$1,088	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	2	SQ YD	$85.17		$170	
	PWFn =	0.3554		PW =	0.3554	X	$6,358	$2,260
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	11	SQ YD	$150.00		$1,650	
	LONGITUDINAL SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	816	LIN FT	$2.00		$1,632	
	RANDOM CRACK R&S	50.00%	510	LIN FT	$2.00		$1,020	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	11	SQ YD	$85.17		$937	
	PWFn =	0.3066		PW =	0.3066	X	$9,319	$2,857
								$36,504
	ROUTINE MAINTENANCE ACTIVITY		0.19	Lane Miles	$0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$36,504
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$15,414

BDE 5401 Template (Rev. 09/05/2013)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 10/24/2017

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Wolf Road
Section: 583-R
County: Cook
Location: at Wolf Road (Roundabout)
Comments: IL 58 @ Wolf Rd (Roundabout)
Design Date: 02/10/2017
Modify Date:

	<-- BY ADT	<-- BY Year
Current:	12,000	2015
Future:	23,000	2040

Facility Type: Unmarked State Route
# of Lanes = 4
Road Class: I
Subgrade Support Rating (SSR): Poor
Construction Year: 2018
Design Period (DP) = 20 years

	Structural Design Traffic: Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	No Min	16,905	95.4%	P = 32%
SU =	No Min	638	3.6%	S = 45%
MU =	No Min	177	1.0%	M = 45%
Struct. Design ADT =		17,720	(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	132.5		Csu =	143.81	
Cmu =	482.53		Cmu =	696.42	
TF flexible (Actual) =	1.55	(Actual ADT)	TF rigid (Actual) =	1.95	(Actual ADT)
TF flexible (Min) =	No Min	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	No Min	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 1.55
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 106 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 8.75 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 8.75 inches

JPC Pavement

Use TF rigid = 1.95
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 8.25 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 1.95
IBR value = 3

CRCP Thickness = 7.00 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 1.55
Goto Map
HMA Overlay Design Thickness = 6.00 in. (Fig. 54-5.U)
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C) PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients: Rigid (Fig. 54-4.C) Csu	Cmu	Flexible (Fig. 54-5.B) Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B) Rural P	S	M	Urban P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 09/05/2013) Printed: 10/24/2017

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	**Wolf Road**
SECTION	**583-R**
COUNTY	**Cook**
LOCATION	**at Wolf Road (Roundabout)**
FACILITY TYPE	**NON-INTERSTATE**

PROJECT LENGTH			**320**	FT = = >	0.06 Miles
# OF CENTERLINES			**0**	CL	
# OF LANES			**4**	LANES	
# OF EDGES			**4**	EP	
LANE WIDTH - AVERAGE			**10**	FT	
SHOULDER WIDTH	HMA	Inside	**0**	FT	
	HMA	Outside	**0**	FT	
	Total Width of Paved Shoulders		**0**	FT	

PAVEMENT THICKNESS (FLEXIBLE)	**8.75** IN	**14.50** IN MAX	
SHOULDER THICKNESS	**8.00** IN	HMA_SD	**Standard Design**
POLICY OVERLAY THICKNESS	**2.25** IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	No Min	**1.55**	**1.55**

Read Me!

HMA COST PER TON	UNIT PRICE	
HMA SURFACE	**$100.70**	/ TON
HMA TOP BINDER	**$99.24**	/ TON
HMA LOWER BINDER	**$89.50**	/ TON
HMA BINDER (LEVELING)	**$99.24**	/ TON
HMA SHOULDER	**$72.00**	/ TON

INITIAL COSTS

ITEM	THICKNESS		100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(8.75")	1422	1,422	SQ YD	*	**$46.89**	/ SQ YD	$66,688	~
HMA SURFACE COURSE	(2.00")	1.0083	161	TONS		**$100.70**	/ TON	$0	
HMA TOP BINDER COURSE	(2.25")	1.0260	184	TONS		**$99.24**	/ TON	$0	
HMA LOWER BINDER COURSE	(4.50")	1.0542	378	TONS		**$89.50**	/ TON	$0	
HMA SHOULDER	(8.00")	0	0	TONS		**$72.00**	/ TON	$0	~
CURB & GUTTER			1,280	LIN FT	*	**$30.00**	/ LIN FT	$38,400	
SUBBASE GRAN MATL TY C (TONS)			2	TONS		**$25.00**	/ TON	$50	
IMPROVED SUBGRADE:	Aggregate	Width = 44.9'	1,597	SQ YD		**$7.00**	/ SQ YD	$11,179	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
PAVEMENT REMOVAL			1,422	SQ YD		**$15.00**	/ SQ YD	$21,330	
SHOULDER REMOVAL			0	SQ YD		**$0.00**	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$137,647
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$92,630

MAINTENANCE COSTS:

ITEM		THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY						**$0.00**	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	1.0083	Surface Mix	2.00	**$11.37**	/ SQ YD
HMA OVERLAY PVMT		(2.25")	1.0094		2.25	**$12.74**	/ SQ YD
HMA SURFACE MIX		(1.50")	1.0063	Surface Mix	1.50	**$8.51**	/ SQ YD
HMA BINDER MIX		(0.75")	1.0156	eling Binder Mix	0.75	**$4.23**	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")		Shoulder Mix	2.25	**$9.07**	/ SQ YD
HMA OVERLAY SHLD		(2.00")		Shoulder Mix	2.00	**$8.06**	/ SQ YD
MILLING (2.00 IN)					2.00	**$3.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)		Surface Mix	2.00	**$81.28**	/ SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	**$78.06**	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	**$81.11**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	**$78.06**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			**$2.00**	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$175,765
FLEXIBLE TOTAL ANNUAL COST PER MILE	$118,282

PCC PAVEMENT — JPCP

ROUTE			Wolf Road		
SECTION			583-R		
COUNTY			Cook		
LOCATION			at Wolf Road (Roundabout)		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			320 FT = = >	0.06 Miles	
# OF CENTERLINES			0 CL		
# OF LANES			4 LANES		
# OF EDGES			4 EP		
LANE WIDTH - AVERAGE			10 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		
	Total Width of Paved Shoulders		0 FT		
PAVEMENT THICKNESS (RIGID)		JPCP	8.25 IN	TIED SHLD	
SHOULDER THICKNESS			8.25 IN		
POLICY OVERLAY THICKNESS			2.50 IN		

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		No Min	1.95	1.95
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(8.25")	1,422	SQ YD		$61.83	/ SQ YD	$87,922
PAVEMENT REINFORCEMENT		0	SQ YD		$22.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	0	SQ YD	*	$19.00	/ SQ YD	$0
PCC SHOULDERS		0	SQ YD		$40.00	/ SQ YD	$0
CURB & GUTTER		1,280	LIN FT	*	$30.00	/ LIN FT	$38,400
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS		$25.00	/ TON	$0
IMPROVED SUBGRADE:	Aggregate Width = 42.0'	1,493	SQ YD		$7.00	/ SQ YD	$10,451
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		1,422	SQ YD		$15.00	/ SQ YD	$21,330
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$158,103
RIGID CONSTRUCTION ANNUAL COST PER MILE	$106,396

MAINTENANCE COSTS:

ITEM	THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY					$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			2.50		
HMA POLICY OVERLAY PVMT	(2.50")	1.0104		2.50	$14.16	/ SQ YD
HMA SURFACE MIX	(1.50")	1.0063	Surface Mix	1.50	$8.51	/ SQ YD
HMA BINDER MIX	(1.00")	1.0167	eling Binder Mix	1.00	$5.65	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder Mix	2.50	$10.08	/ SQ YD
CLASS A PAVEMENT PATCHING					$195.00	/ SQ YD
CLASS B PAVEMENT PATCHING					$150.00	/ SQ YD
CLASS C SHOULDER PATCHING					$145.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)			Surface Mix	1.50	$78.46	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")			Surface Mix	2.50	$84.10	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL					$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)				$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$180,770
RIGID TOTAL ANNUAL COST PER MILE	$121,650

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **2/16/17 9:03 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$158,103	$137,647
		ANNUAL COST PER MILE	$106,396	$92,630
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$22,667	$38,118
		ANNUAL COST PER MILE	$15,254	$25,652
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$180,770	$175,765
		ANNUAL COST PER MILE	$121,650	$118,282

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**HMA**	**$118,282**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**JPCP**	**$121,650**	2.8%

S:\GEN\WPDOCS\Pavement Designs\D-1\IL 58 at Wolf Road - 62B16\[Wolf Rd_IDOT Mech Pvmt Dgn LCCA 09-05-13.xlsm]PDFSheets

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	704	LIN FT	$2.00		$1,408	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	$81.28		$81	
	PWFn =	0.8626		PW =	0.8626	X	$4,049	$3,493
YEAR 10								
	LONG SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	704	LIN FT	$2.00		$1,408	
	PD PVMT PATCH M&F SURF	0.50%	7	SQ YD	$81.28		$569	
	PWFn =	0.7441		PW =	0.7441	X	$4,537	$3,376
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	1,422	SQ YD	$3.00		$4,266	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	14	SQ YD	$81.11		$1,136	
	HMA OVERLAY PVMT 2.00"	100.00%	1,422	SQ YD	$11.37		$16,174	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$8.06		$0	
	PWFn =	0.6419		PW =	0.6419	X	$21,576	$13,849
YEAR 20								
	LONG SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	704	LIN FT	$2.00		$1,408	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	$81.28		$81	
	PWFn =	0.5537		PW =	0.5537	X	$4,049	$2,242
YEAR 25								
	LONG SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	704	LIN FT	$2.00		$1,408	
	PD PVMT PATCH M&F SURF	0.50%	7	SQ YD	$81.28		$569	
	PWFn =	0.4776		PW =	0.4776	X	$4,537	$2,167
	HMA_SD							
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	1,422	SQ YD	$3.00		$4,266	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	28	SQ YD	$81.11		$2,271	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	$78.06		$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	1,422	SQ YD	$12.74		$18,126	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	$9.07		$0	
	PWFn =	0.4120		PW =	0.4120	X	$24,663	$10,161
YEAR 35								
	LONG SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	704	LIN FT	$2.00		$1,408	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	$81.28		$81	
	PWFn =	0.3554		PW =	0.3554	X	$4,049	$1,439
YEAR 40								
	LONG SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	704	LIN FT	$2.00		$1,408	
	PD PVMT PATCH M&F SURF	0.50%	7	SQ YD	$81.28		$569	
	PWFn =	0.3066		PW =	0.3066	X	$4,537	$1,391
								$38,118
	ROUTINE MAINTENANCE ACTIVITY		0.24	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$38,118
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$25,652

JPCP | MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE | 10/24/17

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	1	SQ YD	$150.00		$150	
	PWFn =	0.7441		PW =	0.7441	X	$150	$112
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	3	SQ YD	$150.00		$450	
	PWFn =	0.6419		PW =	0.6419	X	$450	$289
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	28	SQ YD	$150.00		$4,200	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$145.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	PWFn =	0.5537		PW =	0.5537	X	$6,760	$3,743
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	43	SQ YD	$150.00		$6,450	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$145.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$6,450	$3,081
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	57	SQ YD	$150.00		$8,550	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$145.00		$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	1,422	SQ YD	$14.16		$20,141	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	$10.08		$0	
	PWFn =	0.4120		PW =	0.4120	X	$28,691	$11,820
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	RANDOM CRACK R&S	50.00%	640	LIN FT	$2.00		$1,280	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	336	LIN FT	$2.00		$672	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	1	SQ YD	$84.10		$84	
	PWFn =	0.3554		PW =	0.3554	X	$4,596	$1,633
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	7	SQ YD	$150.00		$1,050	
	LONGITUDINAL SHLD JT R&S	100.00%	1,280	LIN FT	$2.00		$2,560	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	504	LIN FT	$2.00		$1,008	
	RANDOM CRACK R&S	50.00%	640	LIN FT	$2.00		$1,280	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	7	SQ YD	$84.10		$589	
	PWFn =	0.3066		PW =	0.3066	X	$6,487	$1,989
								$22,667
	ROUTINE MAINTENANCE ACTIVITY		0.24	Lane Miles	$0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$22,667
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$15,254

BDE 5401 Template (Rev. 09/05/2013)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 10/24/2017

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: Broadway Street
Section: 583-R
County: Cook
Location: at Wolf Road (Roundabout)
Facility Type: Unmarked State Route

Comments: IL 58 @ Wolf Rd (Roundabout)
PCC Minimum thickness is 8" (LCCA unit cost based on 8")
Design Date: 02/10/2017 <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	2,300	2015
Future:	4,000	2040

# of Lanes = 2 or 3
Part of future 4 lanes or more ? No
One Way Street ? No
Road Class: II

Subgrade Support Rating (SSR): Poor
Construction Year: 2018
Design Period (DP) = 20 years

	Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	No Min	2,945	92.5%	P = 50%
SU =	No Min	191	6.0%	S = 50%
MU =	No Min	48	1.5%	M = 50%
Struct. Design ADT =		3,184	(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	112.06		Csu =	135.78	
Cmu =	385.44		Cmu =	567.21	
TF flexible (Actual) =	0.40	(Actual ADT)	TF rigid (Actual) =	0.53	(Actual ADT)
TF flexible (Min) =	No Min	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	No Min	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 0.50 Per BDE 54-5.01(i)-1g
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 147 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 7.00 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 7.00 inches

JPC Pavement

Use TF rigid = 0.53
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 7.75 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 0.53
IBR value = 3

CRCP Thickness = 5.50 in. (Fig. 54-4.N)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 0.50
HMA Overlay Design Thickness = 4.75 in. (Fig. 54-5.U)
Goto Map
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

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LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	**Broadway Street**
SECTION	**583-R**
COUNTY	**Cook**
LOCATION	**at Wolf Road (Roundabout)**
FACILITY TYPE	**NON-INTERSTATE**

PROJECT LENGTH			**510**	FT = = >	0.10 Miles
# OF CENTERLINES			**0**	CL	
# OF LANES			**2**	LANES	
# OF EDGES			**4**	EP	
LANE WIDTH - AVERAGE			**20**	FT	
SHOULDER WIDTH	HMA	Inside	**0**	FT	
	HMA	Outside	**0**	FT	
	Total Width of Paved Shoulders		**0**	FT	

PAVEMENT THICKNESS (FLEXIBLE)	**7.00** IN	**14.50** IN MAX	
SHOULDER THICKNESS	**8.00** IN	HMA_SD	**Standard Design**
POLICY OVERLAY THICKNESS	**2.25** IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	No Min	**0.40**	**0.40**

Read Me!

HMA COST PER TON	UNIT PRICE	
HMA SURFACE	**$108.39**	/ TON
HMA TOP BINDER	**$106.00**	/ TON
HMA LOWER BINDER	**$111.85**	/ TON
HMA BINDER (LEVELING)	**$106.00**	/ TON
HMA SHOULDER	**$72.00**	/ TON

INITIAL COSTS

ITEM	THICKNESS		100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(7.00")	2267	2,267	SQ YD	*	**$43.22**	/ SQ YD	$97,965	~
HMA SURFACE COURSE	(2.00")	1.0083	256	TONS		**$108.39**	/ TON	$0	
HMA TOP BINDER COURSE	(2.25")	1.0260	293	TONS		**$106.00**	/ TON	$0	
HMA LOWER BINDER COURSE	(2.75")	1.0469	365	TONS		**$111.85**	/ TON	$0	
HMA SHOULDER	(8.00")	0	0	TONS		**$72.00**	/ TON	$0	~
CURB & GUTTER			2,040	LIN FT	*	**$30.00**	/ LIN FT	$61,200	
SUBBASE GRAN MATL TY C (TONS)			0	TONS		**$25.00**	/ TON	$0	
IMPROVED SUBGRADE:	Aggregate	Width = 44.3'	2,512	SQ YD		**$7.00**	/ SQ YD	$17,584	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
PAVEMENT REMOVAL			2,267	SQ YD		**$15.00**	/ SQ YD	$34,005	
SHOULDER REMOVAL			0	SQ YD		**$0.00**	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$210,754
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$88,990

MAINTENANCE COSTS:

ITEM		THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY						**$0.00**	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	1.0083	Surface Mix	2.00	**$12.24**	/ SQ YD
HMA OVERLAY PVMT		(2.25")	1.0094		2.25	**$13.68**	/ SQ YD
HMA SURFACE MIX		(1.50")	1.0063	Surface Mix	1.50	**$9.16**	/ SQ YD
HMA BINDER MIX		(0.75")	1.0156	eling Binder Mix	0.75	**$4.52**	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")		Shoulder Mix	2.25	**$9.07**	/ SQ YD
HMA OVERLAY SHLD		(2.00")		Shoulder Mix	2.00	**$8.06**	/ SQ YD
MILLING (2.00 IN)					2.00	**$3.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)		Surface Mix	2.00	**$82.14**	/ SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	**$78.06**	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	**$81.87**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	**$78.06**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			**$2.00**	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$270,072
FLEXIBLE TOTAL ANNUAL COST PER MILE	$114,037

PCC PAVEMENT — JPCP

ROUTE			Broadway Street		
SECTION			583-R		
COUNTY			Cook		
LOCATION			at Wolf Road (Roundabout)		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			510 FT = = >	0.10	Miles
# OF CENTERLINES			0 CL		
# OF LANES			2 LANES		
# OF EDGES			4 EP		
LANE WIDTH - AVERAGE			20 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		
	Total Width of Paved Shoulders		0 FT		
PAVEMENT THICKNESS (RIGID)		JPCP	7.75 IN	TIED SHLD	
SHOULDER THICKNESS			7.75 IN		
POLICY OVERLAY THICKNESS			2.50 IN		

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		No Min	0.53	0.53
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(7.75")	2,267	SQ YD		$62.50	/ SQ YD	$141,688
PAVEMENT REINFORCEMENT		0	SQ YD		$22.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	0	SQ YD	*	$19.00	/ SQ YD	$0
PCC SHOULDERS		0	SQ YD		$40.00	/ SQ YD	$0
CURB & GUTTER		2,040	LIN FT	*	$30.00	/ LIN FT	$61,200
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS		$25.00	/ TON	$0
IMPROVED SUBGRADE:	Aggregate Width = 42.0'	2,380	SQ YD		$7.00	/ SQ YD	$16,660
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		2,267	SQ YD		$15.00	/ SQ YD	$34,005
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$253,553
RIGID CONSTRUCTION ANNUAL COST PER MILE	$107,062

MAINTENANCE COSTS:

ITEM	THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY					$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			2.50		
HMA POLICY OVERLAY PVMT	(2.50")	1.0104		2.50	$15.20	/ SQ YD
HMA SURFACE MIX	(1.50")	1.0063	Surface Mix	1.50	$9.16	/ SQ YD
HMA BINDER MIX	(1.00")	1.0167	eling Binder Mix	1.00	$6.03	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder Mix	2.50	$10.08	/ SQ YD
CLASS A PAVEMENT PATCHING					$195.00	/ SQ YD
CLASS B PAVEMENT PATCHING					$150.00	/ SQ YD
CLASS C SHOULDER PATCHING					$145.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)			Surface Mix	1.50	$79.10	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")			Surface Mix	2.50	$85.17	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL					$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)				$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$290,057
RIGID TOTAL ANNUAL COST PER MILE	$122,476

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **2/16/17 11:21 AM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$253,553	$210,754
		ANNUAL COST PER MILE	$107,062	$88,990
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$36,504	$59,318
		ANNUAL COST PER MILE	$15,414	$25,047
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$290,057	$270,072
		ANNUAL COST PER MILE	$122,476	$114,037

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**HMA**	**$114,037**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**JPCP**	**$122,476**	7.4%

S:\GEN\WPDOCS\Pavement Designs\D-1\IL 58 at Wolf Road - 62B16\[Broadway St_IDOT Mech Pvmt Dgn LCCA 09-05-13.xlsm]PDFSheets

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$82.14		$164	
	PWFn =	0.8626		PW =	0.8626	X	$5,366	$4,629
YEAR 10								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.50%	11	SQ YD	$82.14		$904	
	PWFn =	0.7441		PW =	0.7441	X	$6,106	$4,543
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	2,267	SQ YD	$3.00		$6,801	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	23	SQ YD	$81.87		$1,883	
	HMA OVERLAY PVMT 2.00"	100.00%	2,267	SQ YD	$12.24		$27,746	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$8.06		$0	
	PWFn =	0.6419		PW =	0.6419	X	$36,430	$23,383
YEAR 20								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$82.14		$164	
	PWFn =	0.5537		PW =	0.5537	X	$5,366	$2,971
YEAR 25								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.50%	11	SQ YD	$82.14		$904	
	PWFn =	0.4776		PW =	0.4776	X	$6,106	$2,916
	HMA_SD							
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	2,267	SQ YD	$3.00		$6,801	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	45	SQ YD	$81.87		$3,684	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	$78.06		$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	2,267	SQ YD	$13.68		$31,015	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	$9.07		$0	
	PWFn =	0.4120		PW =	0.4120	X	$41,500	$17,097
YEAR 35								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$82.14		$164	
	PWFn =	0.3554		PW =	0.3554	X	$5,366	$1,907
YEAR 40								
	LONG SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	561	LIN FT	$2.00		$1,122	
	PD PVMT PATCH M&F SURF	0.50%	11	SQ YD	$82.14		$904	
	PWFn =	0.3066		PW =	0.3066	X	$6,106	$1,872
								$59,318
	ROUTINE MAINTENANCE ACTIVITY		0.19	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$59,318
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$25,047

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	2	SQ YD	$150.00		$300	
	PWFn =	0.7441		PW =	0.7441	X	$300	$223
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	5	SQ YD	$150.00		$750	
	PWFn =	0.6419		PW =	0.6419	X	$750	$481
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	45	SQ YD	$150.00		$6,750	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$145.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	PWFn =	0.5537		PW =	0.5537	X	$10,830	$5,996
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	68	SQ YD	$150.00		$10,200	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$145.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$10,200	$4,872
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	91	SQ YD	$150.00		$13,650	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$145.00		$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	2,267	SQ YD	$15.20		$34,446	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	$10.08		$0	
	PWFn =	0.4120		PW =	0.4120	X	$48,096	$19,815
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	RANDOM CRACK R&S	50.00%	510	LIN FT	$2.00		$1,020	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	544	LIN FT	$2.00		$1,088	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	2	SQ YD	$85.17		$170	
	PWFn =	0.3554		PW =	0.3554	X	$6,358	$2,260
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	11	SQ YD	$150.00		$1,650	
	LONGITUDINAL SHLD JT R&S	100.00%	2,040	LIN FT	$2.00		$4,080	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	816	LIN FT	$2.00		$1,632	
	RANDOM CRACK R&S	50.00%	510	LIN FT	$2.00		$1,020	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	11	SQ YD	$85.17		$937	
	PWFn =	0.3066		PW =	0.3066	X	$9,319	$2,857
								$36,504
	ROUTINE MAINTENANCE ACTIVITY		0.19	Lane Miles	$0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$36,504
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$15,414

BDE 5401 Template (Rev. 09/05/2013)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 10/24/2017

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: State Street
Section: 583-R
County: Cook
Location: at Wolf Road (Roundabout)
Comments: IL 58 @ Wolf Rd (Roundabout)
Design Date: 02/10/2017
Modify Date:

Facility Type: Unmarked State Route

# of Lanes = 2 or 3
Part of future 4 lanes or more ? No
One Way Street ? No
Road Class: II

Subgrade Support Rating (SSR): Poor
Construction Year: 2018
Design Period (DP) = 20 years

<-- BY
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	ADT	Year
Current:	5,300	2015
Future:	8,000	2040

	Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	No Min	6,268	93.5%	P = 50%
SU =	No Min	369	5.5%	S = 50%
MU =	No Min	67	1.0%	M = 50%
Struct. Design ADT =		6,704	(2028)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	112.06		Csu =	135.78	
Cmu =	385.44		Cmu =	567.21	
TF flexible (Actual) =	0.68	(Actual ADT)	TF rigid (Actual) =	0.89	(Actual ADT)
TF flexible (Min) =	No Min	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	No Min	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 0.68
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 74.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 134 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 7.50 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.50 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 7.50 inches

JPC Pavement

Use TF rigid = 0.89
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 7.75 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 0.89
IBR value = 3

CRCP Thickness = 6.00 in. (Fig. 54-4.N)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 0.68
HMA Overlay Design Thickness = 5.00 in. (Fig. 54-5.U)
Goto Map
Limiting Strain Criterion Thickness = in. (Fig. 54-5.V)

Use HMA Overlay Thickness = 999.00 inches

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 09/05/2013) Printed: 10/24/2017

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	**State Street**
SECTION	**583-R**
COUNTY	**Cook**
LOCATION	**at Wolf Road (Roundabout)**
FACILITY TYPE	**NON-INTERSTATE**

PROJECT LENGTH			**380**	FT = = >	0.07	Miles
# OF CENTERLINES			**0**	CL		
# OF LANES			**2**	LANES		
# OF EDGES			**4**	EP		
LANE WIDTH - AVERAGE			**20**	FT		
SHOULDER WIDTH	HMA	Inside	**0**	FT		
	HMA	Outside	**0**	FT		
	Total Width of Paved Shoulders		**0**	FT		

PAVEMENT THICKNESS (FLEXIBLE)	**7.50**	IN	**14.50**	IN MAX
SHOULDER THICKNESS	**8.00**	IN	HMA_SD	**Standard Design**
POLICY OVERLAY THICKNESS	**2.25**	IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	No Min	**0.68**	**0.68**

Read Me!

HMA COST PER TON	UNIT PRICE	
HMA SURFACE	**$96.91**	/ TON
HMA TOP BINDER	**$95.75**	/ TON
HMA LOWER BINDER	**$104.12**	/ TON
HMA BINDER (LEVELING)	**$95.75**	/ TON
HMA SHOULDER	**$72.00**	/ TON

INITIAL COSTS

ITEM	THICKNESS		100% QUANTITY	UNIT		UNIT PRICE		COST	
HMA PAVEMENT (FULL-DEPTH)	(7.50")	1689	1,689	SQ YD	*	**$42.60**	/ SQ YD	$71,947	~
HMA SURFACE COURSE	(2.00")	1.0083	191	TONS		**$96.91**	/ TON	$0	
HMA TOP BINDER COURSE	(2.25")	1.0260	218	TONS		**$95.75**	/ TON	$0	
HMA LOWER BINDER COURSE	(3.25")	1.0490	322	TONS		**$104.12**	/ TON	$0	
HMA SHOULDER	(8.00")	0	0	TONS		**$72.00**	/ TON	$0	~
CURB & GUTTER			1,520	LIN FT	*	**$30.00**	/ LIN FT	$45,600	
SUBBASE GRAN MATL TY C (TONS)			0	TONS		**$25.00**	/ TON	$0	
IMPROVED SUBGRADE:	Aggregate	Width = 44.5'	1,879	SQ YD		**$7.00**	/ SQ YD	$13,153	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
Reserved For User Supplied Item			0	**UNITS**		**$0.00**	/ UNITS	$0	
PAVEMENT REMOVAL			1,689	SQ YD		**$15.00**	/ SQ YD	$25,335	
SHOULDER REMOVAL			0	SQ YD		**$0.00**	/ SQ YD	$0	

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$156,035
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$88,425

MAINTENANCE COSTS:

ITEM		THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY						**$0.00**	LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	1.0083	Surface Mix	2.00	**$10.94**	/ SQ YD
HMA OVERLAY PVMT		(2.25")	1.0094		2.25	**$12.28**	/ SQ YD
HMA SURFACE MIX		(1.50")	1.0063	Surface Mix	1.50	**$8.19**	/ SQ YD
HMA BINDER MIX		(0.75")	1.0156	eling Binder Mix	0.75	**$4.08**	/ SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")		Shoulder Mix	2.25	**$9.07**	/ SQ YD
HMA OVERLAY SHLD		(2.00")		Shoulder Mix	2.00	**$8.06**	/ SQ YD
MILLING (2.00 IN)					2.00	**$3.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)		Surface Mix	2.00	**$80.85**	/ SQ YD

PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	2.00	**$78.06**	/ SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	**$80.72**	/ SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	2.00	**$78.06**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)			**$2.00**	/ LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$197,859
FLEXIBLE TOTAL ANNUAL COST PER MILE	$112,127

PCC PAVEMENT — JPCP

ROUTE			State Street		
SECTION			583-R		
COUNTY			Cook		
LOCATION			at Wolf Road (Roundabout)		
FACILITY TYPE			NON-INTERSTATE		
PROJECT LENGTH			380 FT = = >	0.07	Miles
# OF CENTERLINES			0 CL		
# OF LANES			2 LANES		
# OF EDGES			4 EP		
LANE WIDTH - AVERAGE			20 FT		
SHOULDER WIDTH	PCC	Inside	0 FT		
	PCC	Outside	0 FT		
	Total Width of Paved Shoulders		0 FT		
PAVEMENT THICKNESS (RIGID)		JPCP	7.75 IN	TIED SHLD	
SHOULDER THICKNESS			7.75 IN		
POLICY OVERLAY THICKNESS			2.50 IN		

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	No Min	0.89	0.89
Worksheet Construction Type is Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(7.75")	1,689	SQ YD		$64.85	/ SQ YD	$109,532
PAVEMENT REINFORCEMENT		0	SQ YD		$22.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.00")	0	SQ YD	*	$19.00	/ SQ YD	$0
PCC SHOULDERS		0	SQ YD		$40.00	/ SQ YD	$0
CURB & GUTTER		1,520	LIN FT	*	$30.00	/ LIN FT	$45,600
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS		$25.00	/ TON	$0
IMPROVED SUBGRADE:	Aggregate Width = 42.0'	1,773	SQ YD		$7.00	/ SQ YD	$12,411
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		1,689	SQ YD		$15.00	/ SQ YD	$25,335
SHOULDER REMOVAL		0	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$192,878
RIGID CONSTRUCTION ANNUAL COST PER MILE	$109,304

MAINTENANCE COSTS:

ITEM	THICKNESS		MATERIAL	T	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY					$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			2.50		
HMA POLICY OVERLAY PVMT	(2.50")	1.0104		2.50	$13.64	/ SQ YD
HMA SURFACE MIX	(1.50")	1.0063	Surface Mix	1.50	$8.19	/ SQ YD
HMA BINDER MIX	(1.00")	1.0167	eling Binder Mix	1.00	$5.45	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder Mix	2.50	$10.08	/ SQ YD
CLASS A PAVEMENT PATCHING					$195.00	/ SQ YD
CLASS B PAVEMENT PATCHING					$150.00	/ SQ YD
CLASS C SHOULDER PATCHING					$145.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)			Surface Mix	1.50	$78.14	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")			Surface Mix	2.50	$83.57	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL					$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)				$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$219,046
RIGID TOTAL ANNUAL COST PER MILE	$124,133

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **2/16/17 12:57 PM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$192,878	$156,035
		ANNUAL COST PER MILE	$109,304	$88,425
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$26,168	$41,824
		ANNUAL COST PER MILE	$14,829	$23,702
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$219,046	$197,859
		ANNUAL COST PER MILE	$124,133	$112,127

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**HMA**	**$112,127**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**JPCP**	**$124,133**	**10.7%**

S:\GEN\WPDOCS\Pavement Designs\D-1\IL 58 at Wolf Road - 62B16\[State St_IDOT Mech Pvmt Dgn LCCA 09-05-13.xlsm]PDFSheets

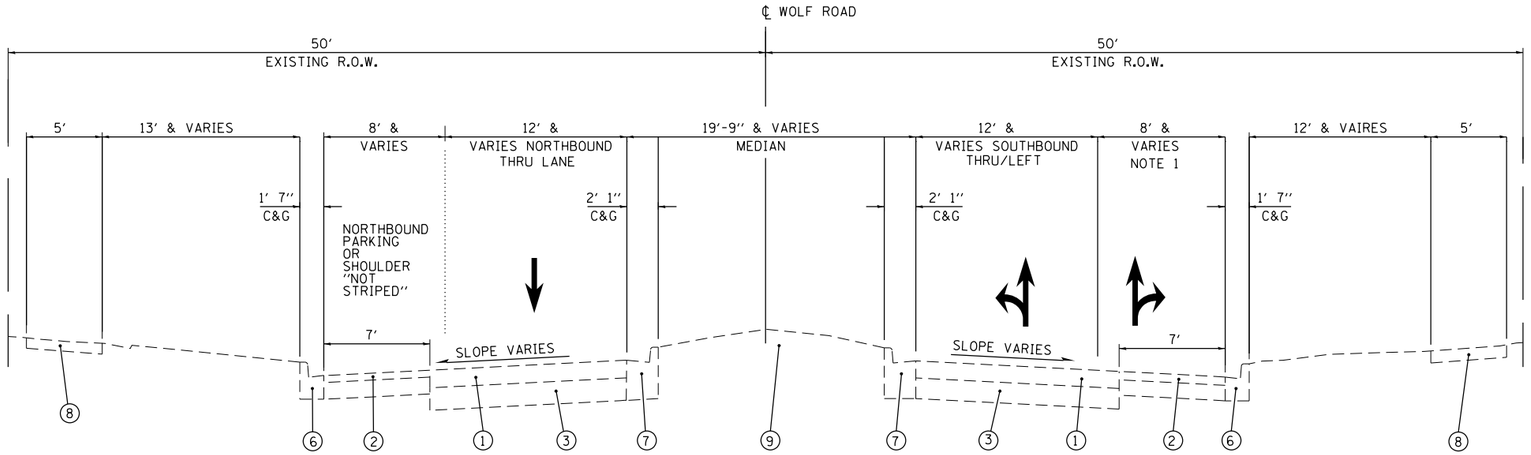
FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	418	LIN FT	$2.00		$836	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$80.85		$162	
	PWFn =	0.8626		PW =	0.8626	X	$4,038	$3,483
YEAR 10								
	LONG SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	418	LIN FT	$2.00		$836	
	PD PVMT PATCH M&F SURF	0.50%	8	SQ YD	$80.85		$647	
	PWFn =	0.7441		PW =	0.7441	X	$4,523	$3,366
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	1,689	SQ YD	$3.00		$5,067	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	17	SQ YD	$80.72		$1,372	
	HMA OVERLAY PVMT 2.00"	100.00%	1,689	SQ YD	$10.94		$18,484	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	$8.06		$0	
	PWFn =	0.6419		PW =	0.6419	X	$24,923	$15,997
YEAR 20								
	LONG SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	418	LIN FT	$2.00		$836	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$80.85		$162	
	PWFn =	0.5537		PW =	0.5537	X	$4,038	$2,236
YEAR 25								
	LONG SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	418	LIN FT	$2.00		$836	
	PD PVMT PATCH M&F SURF	0.50%	8	SQ YD	$80.85		$647	
	PWFn =	0.4776		PW =	0.4776	X	$4,523	$2,160
	HMA_SD							
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	1,689	SQ YD	$3.00		$5,067	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	34	SQ YD	$80.72		$2,745	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	$78.06		$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	1,689	SQ YD	$12.28		$20,732	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	$9.07		$0	
	PWFn =	0.4120		PW =	0.4120	X	$28,544	$11,760
YEAR 35								
	LONG SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	418	LIN FT	$2.00		$836	
	PD PVMT PATCH M&F SURF	0.10%	2	SQ YD	$80.85		$162	
	PWFn =	0.3554		PW =	0.3554	X	$4,038	$1,435
YEAR 40								
	LONG SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CNTR LINE JOINT R&S	100.00%	0	LIN FT	$2.00		$0	
	RNDM / THRM CRACK R&S	50.00%	418	LIN FT	$2.00		$836	
	PD PVMT PATCH M&F SURF	0.50%	8	SQ YD	$80.85		$647	
	PWFn =	0.3066		PW =	0.3066	X	$4,523	$1,387
								$41,824
	ROUTINE MAINTENANCE ACTIVITY		0.14	Lane Miles	0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$41,824
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$23,702

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	2	SQ YD	$150.00		$300	
	PWFn =	0.7441		PW =	0.7441	X	$300	$223
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	3	SQ YD	$150.00		$450	
	PWFn =	0.6419		PW =	0.6419	X	$450	$289
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	34	SQ YD	$150.00		$5,100	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	$145.00		$0	
	LONGITUDINAL SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	PWFn =	0.5537		PW =	0.5537	X	$8,140	$4,507
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	51	SQ YD	$150.00		$7,650	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	$145.00		$0	
	PWFn =	0.4776		PW =	0.4776	X	$7,650	$3,654
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	68	SQ YD	$150.00		$10,200	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	$145.00		$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	1,689	SQ YD	$13.64		$23,041	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	$10.08		$0	
	PWFn =	0.4120		PW =	0.4120	X	$33,241	$13,695
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	RANDOM CRACK R&S	50.00%	380	LIN FT	$2.00		$760	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	400	LIN FT	$2.00		$800	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	2	SQ YD	$83.57		$167	
	PWFn =	0.3554		PW =	0.3554	X	$4,767	$1,694
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	8	SQ YD	$150.00		$1,200	
	LONGITUDINAL SHLD JT R&S	100.00%	1,520	LIN FT	$2.00		$3,040	
	CENTERLINE JT R&S	100.00%	0	LIN FT	$2.00		$0	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	600	LIN FT	$2.00		$1,200	
	RANDOM CRACK R&S	50.00%	380	LIN FT	$2.00		$760	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	8	SQ YD	$83.57		$669	
	PWFn =	0.3066		PW =	0.3066	X	$6,869	$2,106
								$26,168
	ROUTINE MAINTENANCE ACTIVITY		0.14	Lane Miles	$0.00		$0	$0
							MAINTENANCE LIFE-CYCLE COST	$26,168
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE	$14,829

EXISTING AND PROPOSED TYPICAL SECTIONS



TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT WOLF ROAD

VIEW FACING SOUTH TOWARDS ROUNDABOUT (RAB)

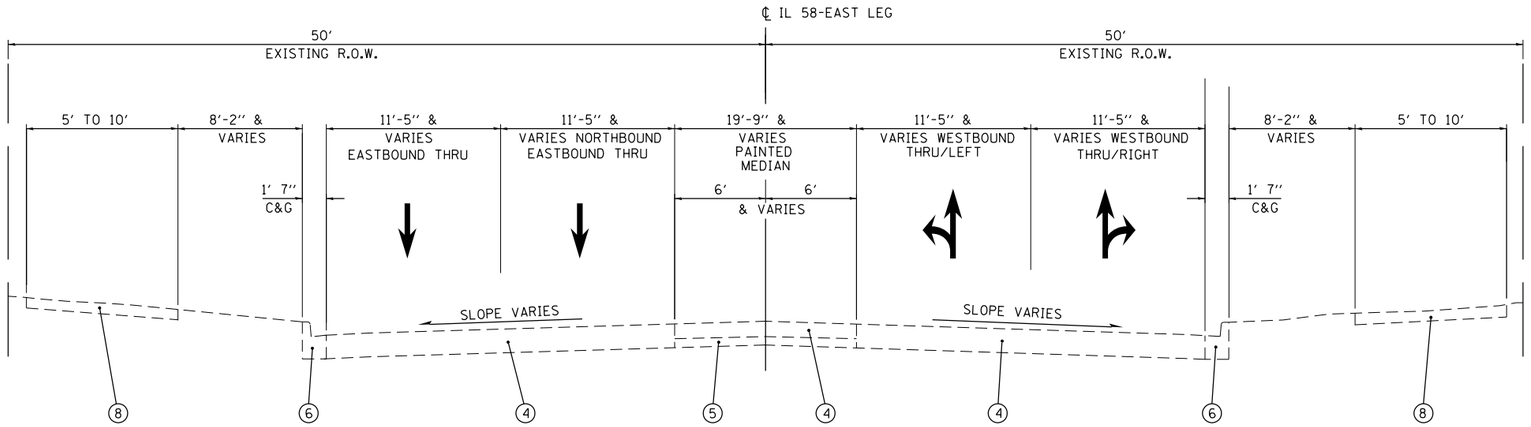
LEGEND

1. EXISTING BITUMINOUS (NOTE 2 - 2″-3″ THICK)
2. EXISTING BITUMINOUS OVERLAY (NOTE 2 - 1.5″ THICK)
3. EXISTING P.C.C. BASE COURSE, (NOTE 2 - 6.5″-8″)
4. EXISTING BITUMINOUS (NOTE 2 - 12″-15″ THICK)
5. EXISTING AGGREGATE (DEPTH UNKNOWN)
6. EXISTING B-6.12 C&G (GUTTER OVERLAYED WITH HMA AT SOME LOCATIONS)
7. EXISTING B-6.18 C&G (GUTTER IS COVERED BY HMA AT SOME LOCATIONS)
8. EXISTING P.C.C. SIDEWALK
9. EXISTING GRASS MEDIAN

NOTES

1. THE SOUTHBOUND NON -STRIPED PARKING LANE TRANSFORMS INTO A THRU/RIGHT TURN LANE AT THE TRAFFIC CIRCLE APPROACH.

2. THE THICKNESSES/MATERIAL TYPE SHOWN ARE FROM HISTORICAL DRAWINGS AND /OR DERIVES FROM PAVEMENT CORES DATA. THE CONTRACTOR SHALL MAKE HIS/HER JUDGEMENT AS TO THE THICKENS'S/MATERIAL TYPE OF PAVEMENT. NO ADDITIONAL COMPENSATION WILL PROVIDED FOR PAYMENT REMOVAL ITEMS IF THE EXISTING PAVEMENT THICKNESSES VARY FROM WHAT IS SHOWN.



TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT ILLINOIS ROUTE 58 (GOLF ROAD–EAST LEG)

VIEW FACING WEST TOWARDS ROUNDABOUT (RAB)

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HBM ENGINEERING GROUP, LLC

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

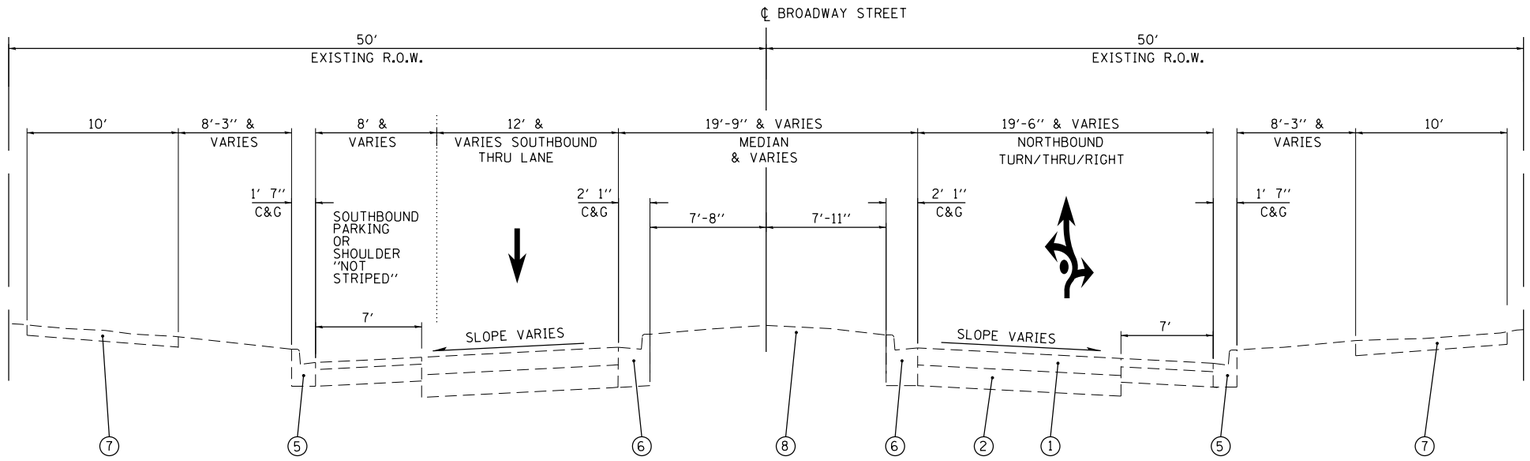
TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION
WOLF RD. & GOLF RD. (EAST LEG)

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	10

CONTRACT NO. 62B16

ILLINOIS FED. AID PROJECT



TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT BROADWAY STREET

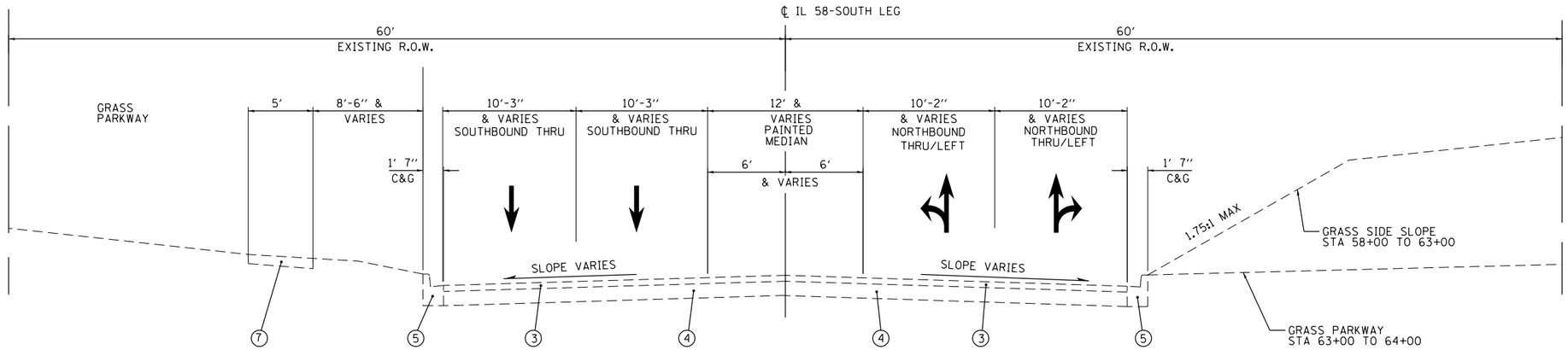
VIEW FACING SOUTH TOWARDS ROUNDABOUT (RAB)

LEGEND

1. EXISTING BITUMINOUS (NOTE 1 - 2.5″-3″ THICK)
2. EXISTING P.C.C PAVEMENT (NOTE 1 - 8.5″-9″ THICK)
3. EXISTING BITUMINOUS (NOTE 1 - 3.5″-5.5″ THICK)
4. EXISTING P.C.C. PAVEMENT (NOTE 1 - 7.5″-10.5″ THICK)
5. EXISTING B-6.12 C&G (GUTTER OVERLAYED WITH HMA AT SOME LOCATIONS)
6. EXISTING B-6.18 C&G (GUTTER OVERLAYED WITH HMA AT SOME LOCATIONS)
7. EXISTING P.C.C. SIDEWALK
8. EXISTING GRASS MEDIAN

NOTE

1. THE THICKNESSES/MATERIAL TYPE SHOWN ARE FROM HISTORICAL DRAWINGS AND /OR DERIVES FROM PAVEMENT CORES DATA. THE CONTRACTOR SHALL MAKE HIS/HER JUDGEMENT AS TO THE THICKENS'S/MATERIAL TYPE OF PAVEMENT. NO ADDITIONAL COMPENSATION WILL PROVIDED FOR PAYMENT REMOVAL ITEMS IF THE EXISTING PAVEMENT THICKNESSES VARY FROM WHAT IS SHOWN.



TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT ILLINOIS ROUTE 58 (GOLF ROAD–SOUTH LEG)

VIEW FACING WEST TOWARDS ROUNDABOUT (RAB)

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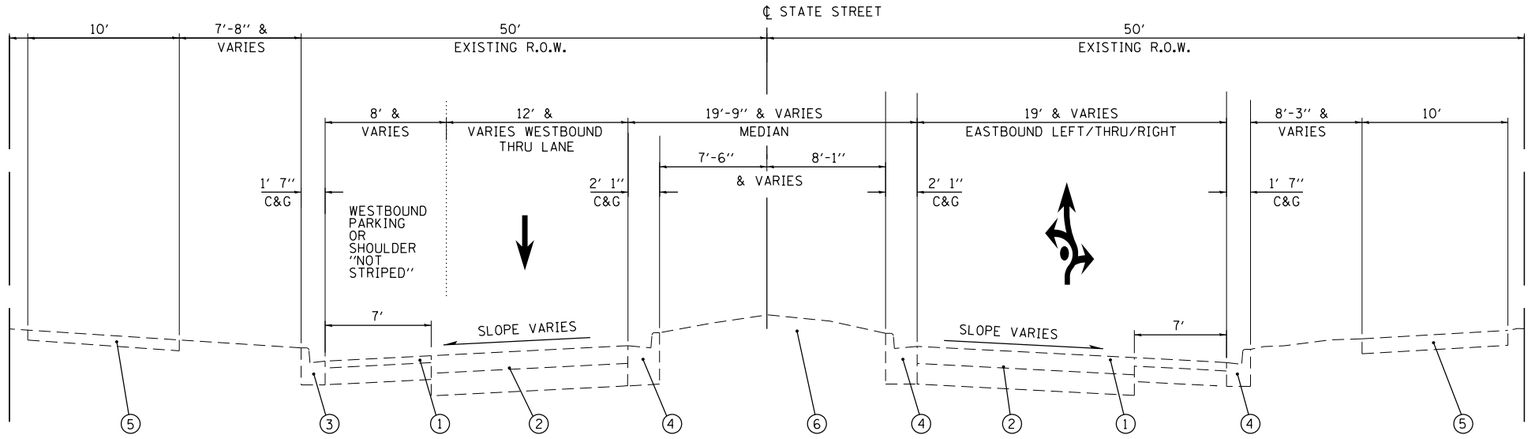
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION
BROADWAY ST. & GOLF RD. (SOUTH LEG)

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	11
		CONTRACT NO. 62B16		
	ILLINOIS FED. AID PROJECT			

8 of 26



TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT STATE STREET

VIEW FACING EAST TOWARDS ROUNDABOUT (RAB)

LEGEND

1. EXISTING BITUMINOUS (1.5''-2.5'' THICK)
2. EXISTING P.C.C PAVEMENT (6.5''-8'' THICK)
3. EXISTING B-6.12 C&G (GUTTER IS COVERED BY HMA AT SOME LOCATIONS)
4. EXISTING B-6.18 C&G (GUTTER IS COVERED BY HMA AT SOME LOCATIONS)
5. EXISTING P.C.C. SIDEWALK
6. EXISTING GRASS MEDIAN

NOTE

1. THE THICKNESSES/MATERIAL TYPE SHOWN ARE FROM HISTORICAL DRAWINGS AND /OR DERIVES FROM PAVEMENT CORES DATA. THE CONTRACTOR SHALL MAKE HIS/HER JUDGEMENT AS TO THE THICKENS'S/MATERIAL TYPE OF PAVEMENT. NO ADDITIONAL COMPENSATION WILL PROVIDED FOR PAYMENT REMOVAL ITEMS IF THE EXISTING PAVEMENT THICKNESSES VARY FROM WHAT IS SHOWN.

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PLOT DATE = 12/22/2016	DATE - 12/22/2016	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

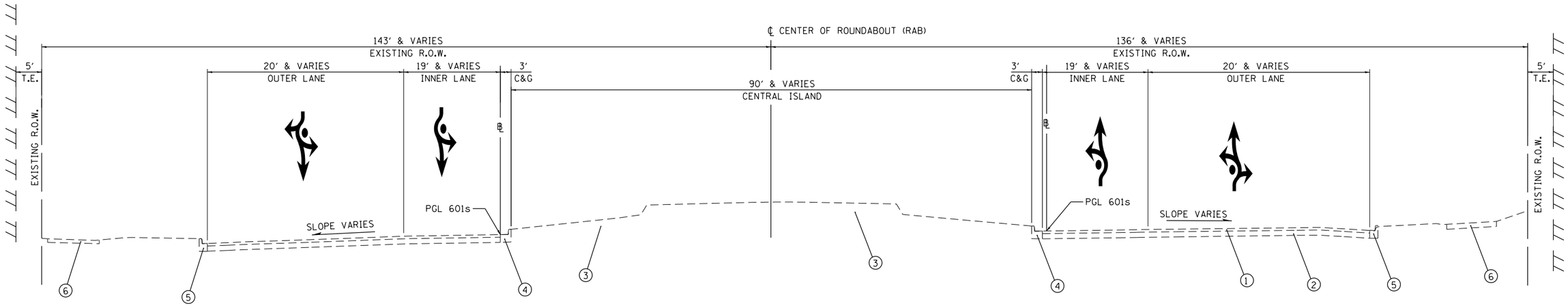
TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION
STATE ST.

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	12

CONTRACT NO. 62B16

ILLINOIS | FED. AID PROJECT



TYPICAL EXISTING ROUNDABOUT (RAB) CROSS SECTION
ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) – 5 TOTAL LEGS

CUMBERLAND CIRCLE

LEGEND

1. EXISTING BITUMINOUS (NOTE 1 - 1.5''-2.5'' THICK)
2. EXISTING P.C.C PAVEMENT (NOTE 1 - 6.5''-8'' THICK)
3. EXISTING LANDSCAPED CENTRAL ISLAND
4. EXISTING B-6.12 C&G (GUTTER OVERLAEYED WITH HMA AT SOME LOCATIONS)
5. EXISTING B-6.18 C&G (GUTTER OVERLAYED WITH HMA AT SOME LOCATIONS)
6. EXISTING P.C.C. SIDEWALK

NOTE

1. THE THICKNESSES/MATERIAL TYPE SHOWN ARE FROM HISTORICAL DRAWINGS AND /OR DERIVES FROM PAVEMENT CORES DATA. THE CONTRACTOR SHALL MAKE HIS/HER JUDGEMENT AS TO THE THICKENS'S/MATERIAL TYPE OF PAVEMENT. NO ADDITIONAL COMPENSATION WILL PROVIDED FOR PAYMENT REMOVAL ITEMS IF THE EXISTING PAVEMENT THICKNESSES VARY FROM WHAT IS SHOWN.

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

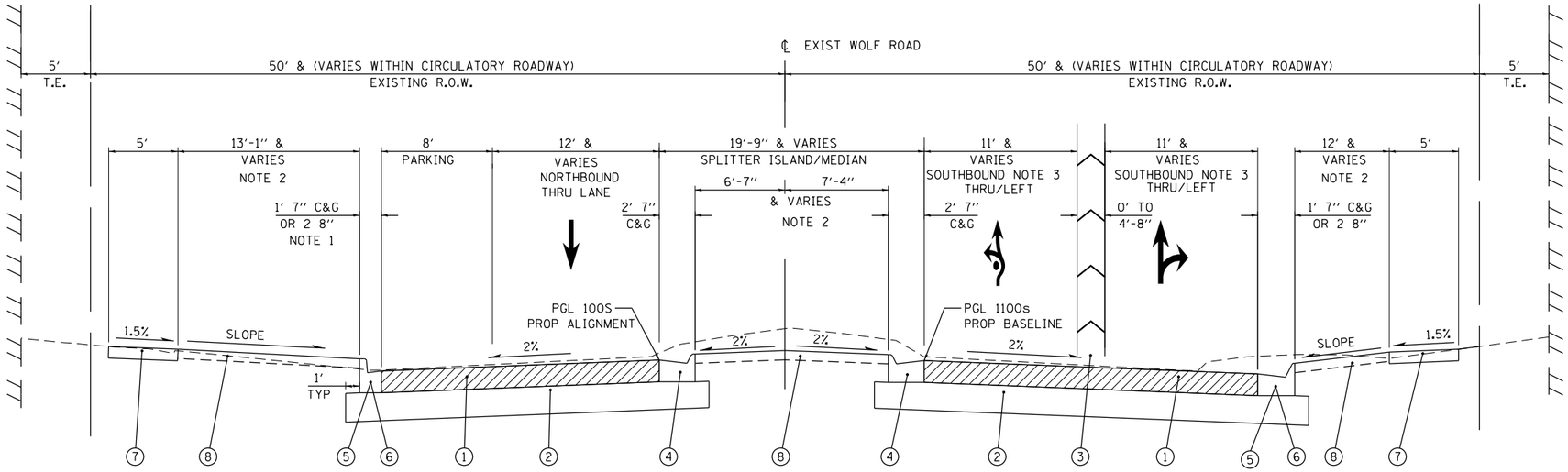
TYPICAL EXISTING APPROACH ROADWAY CROSS SECTION
CUMBERLAND CIRCLE

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	13

CONTRACT NO. 62B16

ILLINOIS | FED. AID PROJECT



LEGEND

1. PROPOSED 9" P.C.C PAVEMENT (JOINTED)
2. PROPOSED 12" AGGREGATE SUBGRADE IMPROVEMENT
3. PROPOSED STRIPING BETWEEN TURN LANES
4. PROPOSED M-4.24 C&G (2'7" WIDE) "SPLITTER ISLAND ONLY"
5. PROPOSED M-6.24 C&G (2'8" WIDE) "CIRCULATORY REGION TO CROSS-WALK"
6. PROPOSED B-6.12 C&G (1'7" WIDE) "CROSS-WALK TO PROJECT LIMITS"
7. PROPOSED P.C.C. SIDEWALK 5"
8. PROPOSED FURNISHED AND PLACING TOPSOIL, 4" (SEE LANDSCAPE PLAN FOR SEEDING TYPE OR SODDING)

TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT WOLF ROAD

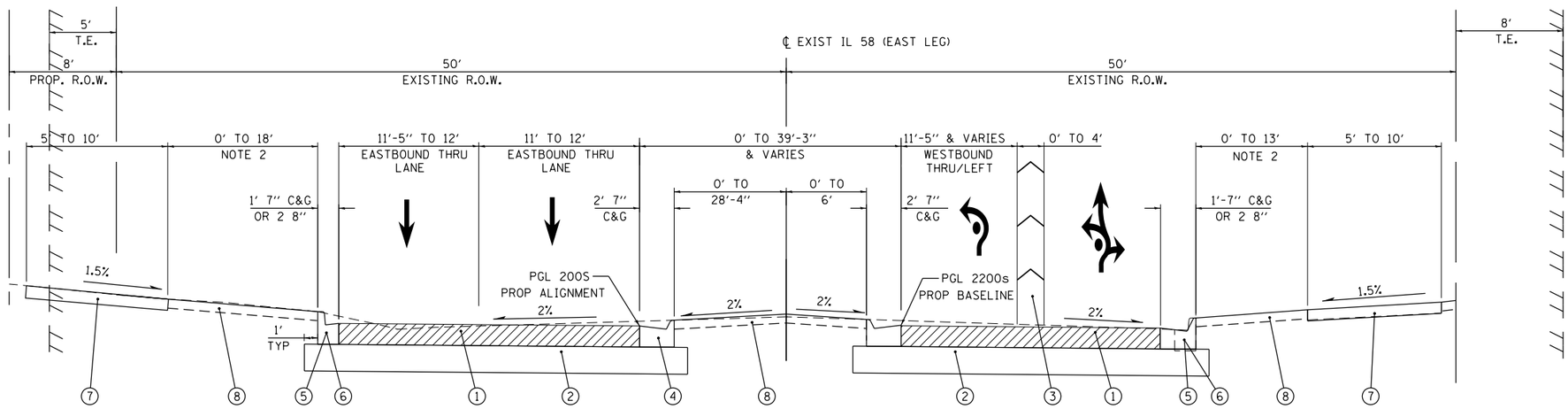
VIEW FACING SOUTH TOWARDS ROUNDABOUT (RAB)

NOTES

1. TRANSITION FROM M-6.24 C&G TO B-6.12 C&G OVER 15'. CURB AND GUTTER TRANSITION SHALL BE LOCATED SO THAT THE CENTER OF C&G TRANSITION IS COINCIDENT WITH CENTER OF THE ADA SIDEWALK RAMP. THE B-6.12 C&G IS FROM THE PROJECT LIMIT TO THE CROSS-WALK.

2. LANDSCAPED PARKWAY OR SPLITTER ISLAND

3. THE DUAL TURN LANES AS SHOWN ON THIS TYPICAL SECTION WILL TRANSITION TO ONE 12-FOOT THRU LANE & ONE 8-FOOT PARKING LANE (NOT STRIPED).



TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT ILLINOIS ROUTE 58 (GOLF ROAD–EAST LEG)

VIEW FACING WEST TOWARDS ROUNDABOUT (RAB)

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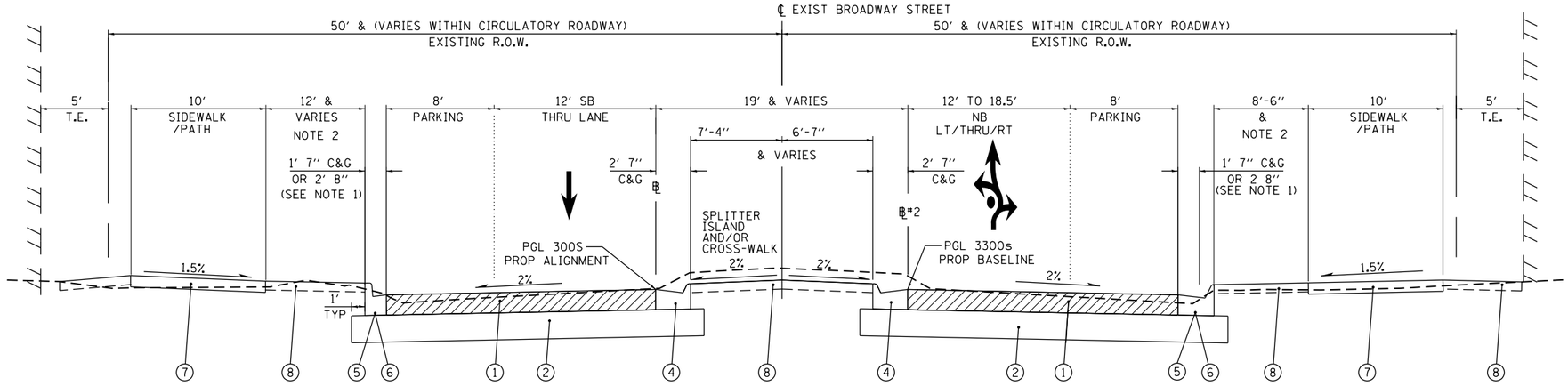
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION
WOLF RD. & GOLF RD. (EAST LEG)

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	14

CONTRACT NO. 62B16
ILLINOIS FED. AID PROJECT



TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION
ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT BROADWAY STREET

VIEW FACING NORTHWEST TOWARDS ROUNDABOUT (RAB)

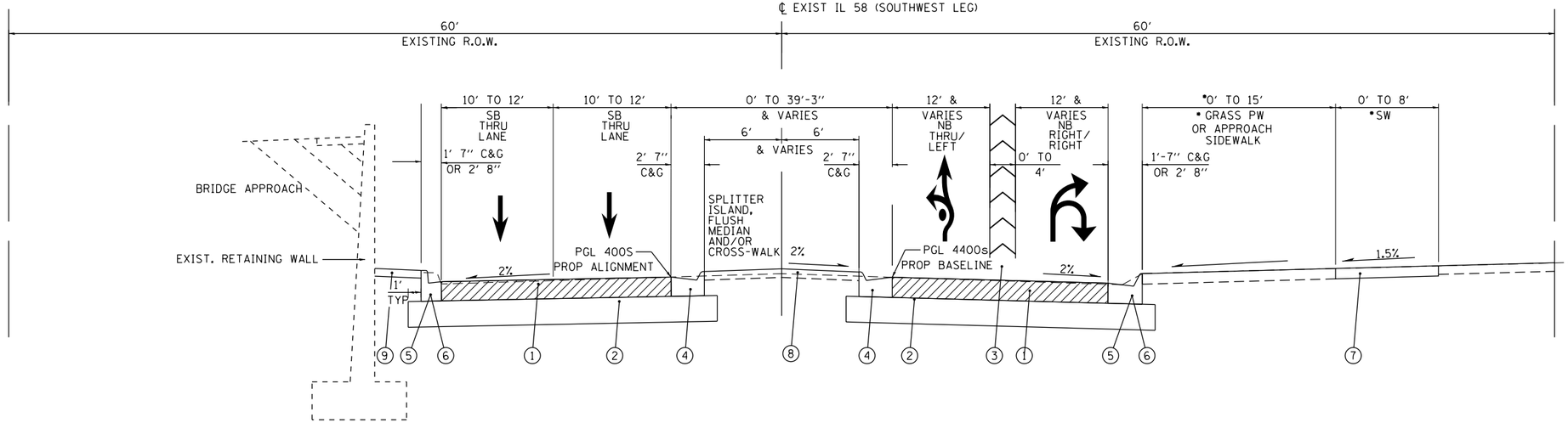
LEGEND

1. PROPOSED 9" P.C.C PAVEMENT (JOINTED)
2. PROPOSED 12" AGGREGATE SUBGRADE IMPROVEMENT
3. PROPOSED STRIPING BETWEEN TURN LANES
4. PROPOSED M-4.24 C&G (2'7" WIDE) "SPLITTER ISLAND ONLY"
5. PROPOSED M-6.24 C&G (2'8" WIDE) "CIRCULATORY REGION TO CROSS-WALK"
6. PROPOSED B-6.12 C&G (1'7" WIDE) "CROSS-WALK TO PROJECT LIMITS"
7. PROPOSED P.C.C. SIDEWALK 5"
8. PROPOSED FURNISHED AND PLACING TOPSOIL, 4" (SEE LANDSCAPE PLAN FOR SEEDING TYPE OR SODDING)
9. PORTLAND CONCRETE SHOULDER 6"

NOTES

1. TRANSITION FROM M-6.24 C&G TO B-6.12 C&G OVER 15'. CURB AND GUTTER TRANSITION SHALL BE LOCATED SO THAT THE CENTER OF C&G TRANSITION IS COINCIDENT WITH CENTER OF THE ADA SIDEWALK RAMP. THE B-6.12 C&G IS FROM THE PROJECT LIMIT TO THE CROSS-WALK.

2. LANDSCAPED PARKWAY OR SPLITTER ISLAND



TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION
ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT ILLINOIS ROUTE 58 (GOLF ROAD–SOUTHWEST LEG)

VIEW FACING WEST TOWARDS ROUNDABOUT (RAB)

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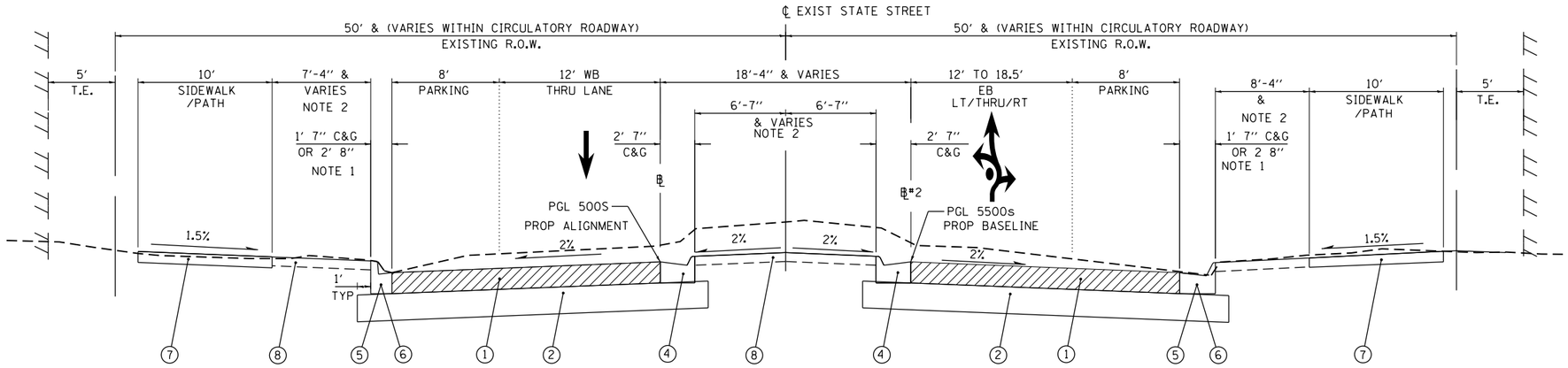
DEPARTMENT OF TRANSPORTATION

TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION
BROADWAY ST. & GOLF RD. (SOUTH LEG)

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	15
		CONTRACT NO. 62B16		
	ILLINOIS FED. AID PROJECT			



LEGEND

1. PROPOSED 9'' P.C.C PAVEMENT (JOINTED)
2. PROPOSED 12'' AGGREGATE SUBGRADE IMPROVEMENT
3. PROPOSED STRIPING BETWEEN TURN LANES
4. PROPOSED M-4.24 C&G (2'7'' WIDE) ''SPLITTER ISLAND ONLY''
5. PROPOSED M-6.24 C&G (2'8'' WIDE) ''CIRCULATORY REGION TO CROSS-WALK''
6. PROPOSED B-6.12 C&G (1'7'' WIDE) ''CROSS-WALK TO PROJECT LIMITS''
7. PROPOSED P.C.C. SIDEWALK 5''
8. PROPOSED FURNISHED AND PLACING TOPSOIL, 4'' (SEE LANDSCAPE PLAN FOR SEEDING TYPE OR SODDING)

NOTES

1. TRANSITION FROM M-6.24 C&G TO B-6.12 C&G OVER 15'. CURB AND GUTTER TRANSITION SHALL BE LOCATED SO THAT THE CENTER OF C&G TRANSITION IS COINCIDENT WITH CENTER OF THE ADA SIDEWALK RAMP. THE B-6.12 C&G IS FROM THE PROJECT LIMIT TO THE CROSS-WALK.
2. LANDSCAPED PARKWAY OR SPLITTER ISLAND

TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION

ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) AT STATE STREET

VIEW FACING EAST TOWARDS ROUNDABOUT (RAB)

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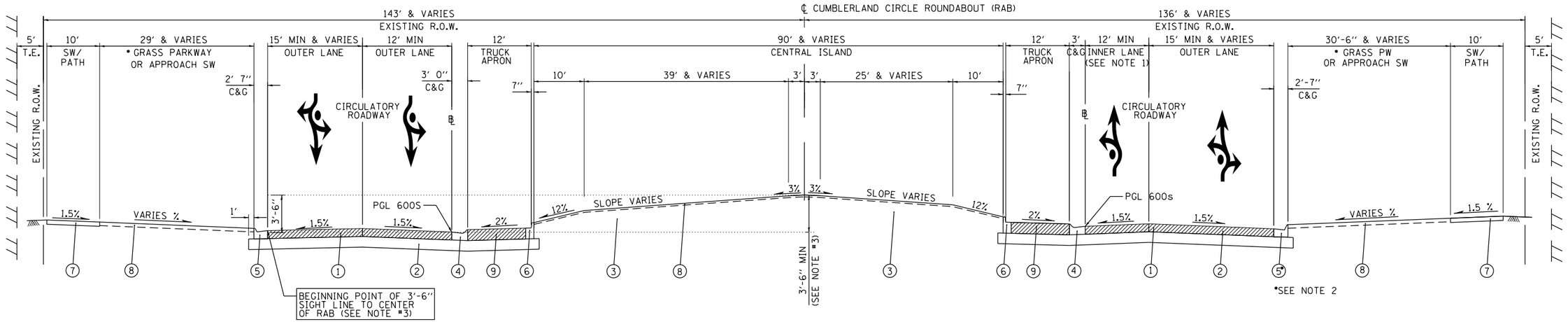
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

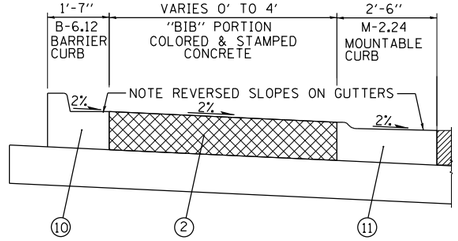
TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION
STATE ST.

SCALE: | SHEET OF SHEETS | STA. | TO STA.

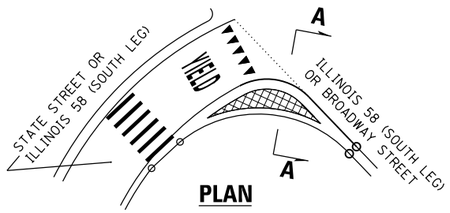
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	16
		CONTRACT NO. 62B16		
	ILLINOIS FED. AID PROJECT			



TYPICAL PROPOSED ROUNDABOUT (RAB) CROSS SECTION
ILLINOIS ROUTE 58 (CUMBERLAND CIRCLE) – 5 TOTAL LEGS

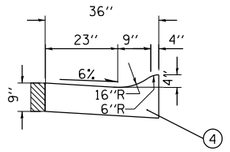


SECTION A–A

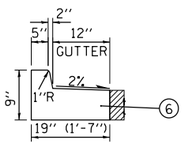


PLAN

DETAIL – TRUCK BIB



DETAIL
COMBINATION CURB AND GUTTER, TYPE M (MODIFIED)



B-9.12 C&G WITH REVERSE CROSS-SLOPE SHALL BE PAID FOR AS COMBINATION C&G TYPE B-9.12

DETAIL
COMBINATION C&G B–9.12 REVERSED CROSS SLOPE

LEGEND

1. PROPOSED 9" P.C.C PAVEMENT (JOINTED)
2. PROPOSED 12" AGGREGATE SUBGRADE IMPROVEMENT
3. PROPOSED LANDSCAPED CENTRAL ISLAND
4. PROPOSED COMBINATION CURB AND GUTTER, TYPE M (MODIFIED) (3' WIDE) FOR INNER EDGE-OF-PAVEMENT - SEE C&G DETAIL
5. PROPOSED M-6.24 C&G (2'8" WIDE) FOR "OUTER" EDGE-OF-PAVEMENT
6. PROPOSED B-9.12 C&G (WITH REVERSE GUTTER CROSS-SLOPE TO FOLLOW 2% TRUCK APRON)
7. PROPOSED P.C.C. SIDEWALK 5"
8. PROPOSED FURNISHED AND PLACING TOPSOIL, 4" (SEE LANDSCAPE PLAN FOR SEEDING TYPE OR SODDING)
9. PROPOSED 12" COLORED & STAMPED P.C.C. PAVEMENT
10. PROPOSED B-6.12 C&G (1'7" WIDE) WITH A REVERSED GUTTER SLOPE OF 2%
11. PROPOSED M-2.24 C&G (2'6" WIDE) WITH A REVERSED GUTTER SLOPE OF 2%

NOTES

1. A PORTION OF THE RAB LANE CONFIGURATION HAS ONLY ONE CIRCULAR LANE (SEE PLAN FOR LANE CONFIGURATIONS).
2. PROIVE TRUCK BIB (SEE PLAN FOR LOCATION AND TRUCK BIB DETAIL ON THIS SHEET.
3. A MINIMUM MOUND HEIGHT OF 3'-6" IS REQUIRED AT THE CENTER OF THE RAB TO THE ENTRANCE OF THE "OUTER" CIRCULATORY LANE. THE SLOPES IN THE CENTRAL ISLANDS' MOUND CAN BE ADJUSTED TO MEET THE REQUIRED 3'-6" DIMENSION IN THE FIELD.

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TYPICAL PROPOSED APPROACH ROADWAY CROSS SECTION
CUMBERLAND CIRCLE

SCALE: | SHEET OF SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
339	583-R	COOK	143	17

CONTRACT NO. 62B16

ILLINOIS FED. AID PROJECT